

As Per NEP 2020

**S. Z. S. P. Mandal's
SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA,
SAWANTWADI (Autonomous)**



Affiliated to University of Mumbai



Title of the program

- A- U.G. Certificate in Computer Science**
- B- U.G. Diploma in Computer Science**
- C- B.Sc. (Computer Science)**
- D- B.Sc. (Hons.) in Computer Science**

Syllabus for

Semester – I &II

Ref: GR dated 20th April, 2023 for Credit Structure of UG

(With effect from the academic year 2026-27 progressively)



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SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA,
SAWANTWADI (Autonomous)



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Sr. No.	Heading	Particulars	
1	Title of program O: _____A	A	U.G. Certificate in Computer Science
	O: _____B	B	U.G. Diploma in Computer Science
	O: _____C	C	B.Sc. (Computer Science)
	O: _____D	D	B.Sc. (Hons.) in Computer Science
2	Eligibility O: _____A	A	A candidate for being eligible for admission must have passed Higher Secondary School Certificate Examination (Std. XII) in Science stream conducted by the Maharashtra State Board of Secondary and Higher Secondary Education with Mathematics and Statistics as one of the subject or its equivalent. Admission will be on merit, based on order of preference as follows: - Aggregate Marks at H.S.C. or equivalent. - Aggregate Marks in Science Group (Physics, Chemistry and Mathematics) - Marks in Mathematics and Statistics and Physics. Marks in Mathematics and Statistics. OR Passed Equivalent Academic Level 4.0 with Mathematics and Statistics as one of the subject
	O: _____B	B	Under Graduate Certificate in Computer Science OR Passed Equivalent Academic Level 4.5
	O: _____C	C	Under Graduate Diploma in Computer Science OR Passed Equivalent Academic Level 5.0

	O: _____ D	D	Bachelors of Science in Computer Science with minimum CGPA of 7.5 OR Passed Equivalent Academic Level 5.5
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3	Duration of program R: _____	A	One Year
		B	Two Years
		C	Three Years
		D	Four Years
4	Intake Capacity R: _____	24 students per division	
5	Scheme of Examination R: _____	NEP 40% Internal 60% External , Semester End Examination Individual Passing in Internal and External Examination	
6	Standards of Passing R: _____	40% in each component	
7	Credit Structure Sem. I - R: _____ A Sem. II - R: _____ B	Attached herewith	
	Credit Structure Sem. III - R: _____ C Sem. IV - R: _____ D		
	Credit Structure Sem. V - R: _____ E Sem. VI - R: _____ F		
8	Semesters	A	Sem I & II
		B	Sem III & IV
		C	Sem V & VI
		D	Sem VII & VIII
9	Program Academic Level	A	4.5
		B	5.0
		C	5.5
		D	6.0
10	Pattern	Semester	
11	Status	New	
12	To be implemented from Academic Year Progressively	From Academic Year: 2026-27	

Preamble

1) Introduction

In the era of Information and Communication Technology (ICT), the transformative impact of computers on society is undeniable. The pervasive applications of computing across diverse fields have given rise to dynamic industries, evolving in tandem with the swift pace of technological change. As the landscape of the computing field continues to advance, it becomes imperative for students to cultivate a robust foundation that not only facilitates their current skills but also empowers them to adapt to the evolving nature of the field.

In line with the National Education Policy (NEP) 2020, our revised Computer Science program is designed to instill in students the ability to navigate the ever-changing technological terrain. Recognizing that specific languages and platforms may undergo transformations, the curriculum places a strong emphasis on fostering adaptability. Students will not only be exposed to a diverse array of programming languages, tools, paradigms, and technologies but will also delve into the fundamental principles that underpin the realm of computer science.

The core of our program encompasses essential courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software engineering. Complementing these foundational elements are specialized courses in areas such as artificial intelligence, computer-based communication networks, distributed computing, information security, graphics, human-computer interaction, multimedia, scientific computing, web technology, and other cutting-edge topics in computer science.

Key Philosophy of the Program:

- **Form Strong Foundations:** Lay the groundwork for a comprehensive understanding of Computer Science.
- **Nurture Skills:** Develop programming, analytical, and design skills to tackle real-world problems effectively.
- **Introduce Gradually:** Familiarize students with emerging trends in a gradual and coherent manner.
- **Prepare for Industry Challenges:** Groom students to meet the challenges of the ICT industry with confidence and competence.

In acknowledgement of the evolving aspirations of students, our program not only prepares them for careers in the industry but also opens doors to research opportunities. The primary goal is to deliver a modern curriculum that equips graduates with both theoretical depth and practical acumen, empowering them to excel in the workplace while fostering a mindset of lifelong learning.

This program not only paves the way for a successful career in the software industry but also inspires students to pursue further studies and research opportunities. Graduates can seamlessly transition into postgraduate programs in Computer Science, leading to research and development roles, employment in IT industries, or even a career in business management.

As we unveil this syllabus, we invite students on a journey of exploration, learning, and innovation, ensuring they are not only prepared for the present but also poised to shape the future of Computer Science.

2) Aims and Objectives

Understanding and Knowledge Base: Develop a profound understanding and knowledge of the fundamental theories, systems, and applications that form the bedrock of Computer Science. This includes establishing a strong foundation in theoretical concepts and cultivating expertise in the practical application of Computer Science theories.

Analytical Abilities and Problem Solving: Foster essential skills and analytical abilities required for devising computer-based solutions to real-life problems. This involves developing critical thinking skills for problem identification and analysis, as well as cultivating the ability to design and implement effective solutions using computational tools.

Training in Emerging Technologies: Provide training in emergent computing technologies, facilitating the development of innovative solutions for both industry and academia. This includes exposing students to cutting-edge technologies and their applications, as well as encouraging exploration and experimentation with emerging tools and platforms.

Preparation for Post-Graduate Studies: Develop the necessary study skills and knowledge for students to pursue further postgraduate study in Computer Science or related fields. This involves equipping students with the academic rigor required for advanced studies and fostering a passion for continuous learning and research in the field.

Professional Skillset Development: Develop the professional skillset required for a successful career in an information technology-oriented business or industry. This includes providing practical exposure to industry-relevant tools and practices, as well as instilling a sense of professional ethics and responsibility.

Independent and Collaborative Work: Enable students to work independently and collaboratively, communicate effectively, and become responsible, competent, confident, insightful, and creative users of computing technology. This involves cultivating independence in problem-solving and project execution, as well as enhancing communication and collaboration skills for effective teamwork.

3) Learning Outcomes

At the end of three year Bachelor of Computer Science the students will be able:

- Formulate, model, and design solutions and procedures, utilizing software tools to address real-world problems effectively.
- Design and develop computer programs and computer-based systems in diverse areas such as networking, web design, security, cloud computing, IoT, data science, and other emerging technologies.
- Familiarize themselves with modern-day trends in industry and research-based settings, fostering the ability to innovate novel solutions to existing problems.
- Apply concepts, principles, and theories related to computer science to new and challenging situations.
- Demonstrate proficiency in using current techniques, skills, and tools essential for computing practice.
- Apply standard Software Engineering practices and strategies in real-time software project development.
- Pursue higher studies of specialization and confidently enter technical employment.
- Work independently or collaboratively as effective team members on substantial software projects, showcasing project management and teamwork skills.
- Communicate and present their work effectively and coherently, both in oral and written formats.
- Display ethical conduct in the usage of the Internet and Cyber systems, understanding and adhering to ethical standards in computing practices.
- Engage in independent and life-long learning, adapting to the rapidly changing IT industry and staying abreast of evolving technologies.

Credit Structure of the Program (Sem I, II, III & IV) Under Graduate Certificate in Computer Science

	R: _____ A									
LEVEL	Semester	Major		Minor	OE	VSC, SEC (VSEC)	AEC, VEC, IKS	OJT, FP, CEP, CC, RP	Cum. Cr. / Sem.	Degree/ Cum. Cr.
		Mandatory	Electives							
4.5	I	MJ1: Digital Systems & Architecture (TH) – 2 MJ2: Database Management System (TH) – 2 MJP1: Computer Science Practical 1 (PR) – 2 6	-	-	OE:2+2 Google Office Automation– 2 AND Multimedia– 2	VSC:2 Python Programming – 2 SEC:2 Web Development Pract – 2 OR AI-Generated Tools & Numerical Computing with NumPy Pract– 2	AEC: 2 Modern Indian Language-I -2 VEC:2 Green IT and Sustainable Computing-2 IKS:2 Vedic Mathematics-2	CC:2 NSS Studies-I	22	UG Certificate 44
	R: _____ B									
	II	MJ3: Design & Analysis of Algorithms (TH) – 2 MJ4: Object Oriented Programming (TH) – 2 MJP2: Computer Science Practical 2 (PR) – 2 6	-	MN:1 Descriptive Statistics– 2	OE:2+2 E-Commerce & Digital Marketing– 2 AND Data Hiding & Spreadsheet-2	VSC:2 Advanced Database Management Systems Pract-2 SEC:2 Linux Operating System Pract– 2 OR Statistics with R Programming Pract– 2	AEC: 2 Modern Indian Language-II -2 VEC:2 Green Enterprise Management and Sustainability -2	CC:2 NSS Studies-II	22	
	Cum Cr.	12	-	2	8	4+4	4+4+2	4	44	
Exit option: Award of UG Certificate in Major with 40-44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										

[Abbreviation - OE – Open Electives, VSC – Vocation Skill Course, SEC – Skill Enhancement Course, (VSEC), AEC – Ability Enhancement Course, VEC – Value Education Course, IKS – Indian Knowledge System, OJT – on Job Training, FP – Field Project, CEP – Continuing Education Program, CC – Co-Curricular, RP – Research Project]

Semester I

Component	Major		Minor	OE	VSC	SEC	AEC	VEC	IKS	CC	Total
	Mandatory	Electives									
Credits	2+2+2	---	---	2+2	2	2	2	2	2	2	22

Component	Code	Subject	Total Credits
Major	USCST111	Digital Systems & Architecture	2
Major	USCST112	Database Management System	2
Major	USCSP113	Computer Science Practical 1	2
OE	CDITOE111	Google Office Automation	2
OE	CDITOE112	Multimedia	2
VSC	CSPVS111	Python Programming Practical	2
SEC (any one)	CSPSE111	Web Development Practical	2
	CSPSE112	AI-Generated Tools & Numerical Computing with NumPy Practical	
AEC	CDITAE111	Modern Indian Language-I	2
VEC	CDITVE111	Green IT and Sustainable Computing	2
IKS	CDITIK111	Vedic Mathematics	2
CC	CDITCC111	NSS Studies-I	2

Semester II

Component	Major		Minor	OE	VSC	SEC	AEC	VEC	IKS	CC	Total
	Mandatory	Electives									
Credits	2+2+2	---	2	2+2	2	2	2	2	---	2	22

Component	Code	Subject	Total Credits
Major	USCST114	Design & Analysis of Algorithms	2
Major	USCST115	Object Oriented Programming using C++	2
Major	USCSP116	Computer Science Practical 2	2
Minor	USCST117	Descriptive Statistics	2
OE	CDITOE113	E-Commerce & Digital Marketing	2
OE	CDITOE114	Data Hiding & Spreadsheet	2
VSC	CSTVS112	Advanced Database Management Systems Practical	2
SEC (any one)	CSPSE113	Linux Operating System Practical	2
	CSPSE114	Statistics with R Programming Practical	
AEC	CSTAE112	Modern Indian Language-II	2
VEC	CSPVE112	Green Enterprise Management and Sustainability	2
CC	CDITCC112	NSS Studies-II	2

Sem – I

Mandatory Courses

Name of the Course: Digital System and Architecture

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Digital Systems and Architecture course serves as a foundational exploration into the fundamental principles governing digital systems and computer architecture. This course delves into the design and organization of digital circuits and systems that form the backbone of modern computing devices. Relevance: In the era of rapid technological advancement, understanding digital systems and architecture is paramount. From smartphones to supercomputers, digital systems are pervasive. This course is essential for anyone aspiring to comprehend the inner workings of these systems and contribute to their development. Usefulness: The course equips students with the knowledge and skills to design, analyze, and optimize digital systems. It serves as a gateway for students to explore various aspects of computer architecture, laying the groundwork for more advanced studies and applications in the field. Application: Knowledge gained in this course finds practical applications in diverse domains, including embedded systems, computer networks, signal processing, and beyond. Students will learn how to translate theoretical concepts into tangible solutions, bridging the gap between abstraction and real-world implementation. Interest: Digital System and Architecture is an intellectually stimulating course that captivates students with its blend of theoretical concepts and hands-on application. The allure of creating efficient and high-performing digital systems often sparks curiosity and enthusiasm among students. Connection with Other Courses: This course establishes crucial linkages with other courses in computer science. It provides a solid foundation for more advanced courses such as computer organization, microprocessor systems, and hardware description languages. The knowledge gained here forms a seamless continuum in the study of computer systems. Demand in the Industry: As the demand for faster, more efficient computing systems continues to rise, professionals well-versed in digital systems and architecture are highly sought after. Industries ranging from electronics and telecommunications to automotive and healthcare actively seek individuals with expertise in designing and optimizing digital systems. Job Prospects:

		Graduates with proficiency in digital systems and architecture find themselves well-positioned for a myriad of career opportunities. Roles may include digital design engineer, embedded systems developer, hardware architect, and systems analyst. The skills acquired in this course open doors to a wide array of industries where digital technology plays a pivotal role.
2	Vertical:	Major
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To understand digital logic concepts, logic simplification, and basic combinational and sequential circuits. CO 2. To analyze computer system components, organization vs architecture, and bus interconnections. CO 3. To understand memory systems, hierarchy, and types of memory. CO 4. To analyze cache performance and memory management techniques. CO 5. To study processor organization, instruction sets, and addressing modes. CO6. To explore advanced architectures, including parallel, multiprocessor, and multi-core systems.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Learn how number systems and codes are useful in computer system design. OC 2. Learn how Flip Flops are useful in memory design and data communication through CPU and Memory and I/O devices. OC 3. Learn about the basics of instruction sets and its types. OC 4. Learn about Processor Internal Architecture and Design.	
9	Modules:- Module 1 (15 hours): Fundamentals of Digital Logic: Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps. Combinational Circuits: Adders, Subtractors, Multiplexer, De-Multiplexer. Sequential Circuits: Flip Flops (SR, JK & D), Counters: synchronous and asynchronous Counter. Computer System: Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures. Bus Interconnections Input / Output: I/O Module Programmed . Module 2 (15 hours):	

	Memory System Organization: Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory. Cache Memory: Design Principles, Memory mappings, Replacement Algorithms, Cache performance, Cache Coherence. Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories, RAID Levels Instructions: Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization: Structure and Function. Register Organization, [8085/8086 CPU]. Basic Microprocessor operations: Data Transfer (Register / Memory) Operations, Arithmetic & Logical Operations.																		
	Advanced Processor Architectures and ILP:Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors, Design Issues. Multiprocessor Systems: Structure & Interconnection Networks, Multi-Core Computers Introduction, Organization and Performance.																		
10	Text Books 1. M. Mano, Computer System Architecture 3rd edition, Pearson 2. Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed., McGraw-Hill 2012 3. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010																		
11	Reference Books 1. William Stallings (2010), Computer Organization and Architecture- designing for performance,8th edition, Prentice Hall, New Jersey. 2. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, PearsonEducation Inc,																		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%																	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.																	
	Total: 20 marks	Total: 30 Marks																	
14	Format of Question Paper: Total Marks: 30 Duration: 1 Hour <table><tr><th>Question</th><th>Based On</th><th>Options</th><th>Marks</th></tr><tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.3</td><td>Module 1&2</td><td>Any 2 out of 4</td><td>10</td></tr></table>			Question	Based On	Options	Marks	Q.1	Module 1	Any 2 out of 4	10	Q.2	Module 2	Any 2 out of 4	10	Q.3	Module 1&2	Any 2 out of 4	10
Question	Based On	Options	Marks																
Q.1	Module 1	Any 2 out of 4	10																
Q.2	Module 2	Any 2 out of 4	10																
Q.3	Module 1&2	Any 2 out of 4	10																

Name of the Course: Database Management System

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Database Management System course is a foundation in the study of information management and technology. It provides students with a comprehensive understanding of the principles, design, and implementation of databases, which are critical

		components in virtually every domain where data is utilized. Relevance: In today's data-driven world, the management and retrieval of information are paramount. This course is highly relevant as it addresses the core concepts essential for organizing, storing, and manipulating data efficiently. Usefulness: This course is immensely useful for individuals aspiring to work with data in various capacities. Whether designing databases, developing applications that interact with databases, or analyzing data trends, a solid understanding of database fundamentals is crucial. Application: The principles learned in this course find application across diverse sectors, including business, healthcare, finance, and technology. Students will gain the skills to model real world scenarios, design efficient databases, and implement systems that store and retrieve information seamlessly. Interest: This course often attracts students due to its practical and tangible applications. The ability to structure and manage data effectively, ensuring its integrity and accessibility, can be intellectually stimulating and applicable to numerous real-world scenarios. Connection with Other Courses: This course forms a vital connection with various other courses in computer science and information technology. It is foundational to courses like database management, data warehousing, and data mining. Additionally, it complements courses related to software development, ensuring a holistic understanding of system architecture. Demand in the Industry: As businesses and organizations amass ever-growing volumes of data, there is an increasing demand for professionals versed in database systems. Industries such as finance, healthcare, e-commerce, and technology actively seek individuals who can design, implement, and manage robust databases. Job Prospects: Graduates proficient in the Database Management System enjoy promising job prospects. Potential roles include database administrator, data analyst, database developer, and business intelligence analyst. These professionals play a pivotal role in ensuring the efficient and secure management of an organization's data assets.
2	Vertical:	Major
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To make students aware of the fundamentals of the database system.	

	CO 2. To give an idea how ERD components are helpful in database design and implementation. CO 3. To experience the students working with databases using MySQL. CO 4. To familiarize the student with normalization, database protection and different DCL Statements. CO 5. To make students aware about the importance of protecting data from unauthorized users. CO 6. To make students aware of granting and revoking rights of data manipulation.
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. To appreciate the importance of database design. OC 2. Analyze database requirements and determine the entities involved in the system and their relationship to one another. OC 3. Write simple queries to MySQL related to String, Maths and Date Functions. OC 4. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands. OC 5. Understand the normalization and its role in the database design process. OC 6. Handle data permissions. OC 7. Create indexes and understand the role of Indexes in optimization search.
9	Modules:- Module 1 (15 hours): Introduction to DBMS: Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture Data models: Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network) Entity Relationship Model and ER to Table: Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER) Entity to Table, Relationship to tables with and without key constraints. DDL Statements: Creating Databases, Using Databases, data types, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables DML statements: Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause Module 2 (15 hours): Relational data model: Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint Functions: String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions(adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables and Subqueries: inner join, outer join (left outer, right outer, full outer) subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL

	clause, correlated subqueries Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control, Backing Up and Restoring databases Views: Creating, altering dropping, renaming and manipulating views DCL Statements: Creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges), Transaction control commands – Commit, Rollback		
10	Text Books 1. Fundamentals of Database System, ElmasriRamez, NavatheShamkant, Pearson Education, Seventh edition, 2017 2. Database Management Systems, Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition,2014 3. Murach's MySQL, Joel Murach, 3rd Edition, 3rd Edition, 2019		
11	Reference Books 1. Database System Concepts, Abraham Silberschatz, HenryF.Korth, S.Sudarshan, McGraw Hill,2017 2. MySQL: The Complete Reference, VikramVaswani , McGraw Hill, 2017 3. Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease, Ashwin Pajankar, BPB Publications, 2020		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Total: 20 marks	Total: 30 Marks	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		Duration: 1 Hour
	Question	Based On	Options
	Marks		
	Q.1	Module 1	Any 2 out of 4
Q.2	Module 2	Any 2 out of 4	
Q.3	Module 1 & 2	Any 2 out of 4	

Name of the Course: Computer Science Practical 1

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Major Computer Science Practical Course, encompassing Digital Systems and Architecture as well as Database Systems, is a comprehensive and hands-on exploration into the foundational aspects of both hardware and software that underpin modern computing. This practical course is designed to provide students with a holistic understanding of digital systems, computer architecture, and the effective management of data within databases.

		Relevance: In an era where seamless integration of hardware and software is pivotal, the combination of Digital Systems and Architecture with Database Systems is highly relevant. This practical course addresses the symbiotic relationship between the two, offering students a holistic perspective on building robust computing solutions. Usefulness: This course is immensely useful for students aiming to bridge the gap between hardware and software. By integrating digital systems with database concepts, students gain a unique skill set that enables them to design, implement, and optimize computing systems comprehensively. Application: The skills acquired in this practical course find direct application in the development of efficient and integrated computing solutions. Students learn to design digital systems, optimize hardware performance, and seamlessly integrate these systems with databases to handle and manipulate data effectively. Interest: The Major Computer Science Practical Course is designed to spark interest by offering a hands-on approach to both hardware and software components. Students engage in practical exercises that involve designing digital circuits, implementing database solutions, and integrating these components, fostering a deeper understanding and appreciation for the intricacies of computing systems. Connection with Other Courses: This practical course serves as a nexus, connecting various other courses in the computer science curriculum. It lays a foundation for advanced courses in computer organization, embedded systems, software engineering, and database management. The integrated approach ensures students comprehend the synergies between different aspects of computer science. Demand in the Industry: Professionals who can seamlessly navigate both digital systems and database management are in high demand. Industries ranging from electronics and telecommunications to software development and data analytics actively seek individuals proficient in both hardware and software aspects, recognizing the practical value of this dual expertise. Job Prospects: Graduates from this practical course enjoy promising job prospects in roles that require a holistic understanding of computing systems. Potential job titles include systems architect, database administrator, embedded systems developer, and hardware-software integration specialist. These professionals are well-positioned to contribute to diverse industries seeking comprehensive computing solutions.
2	Vertical:	Major
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours

6	Marks Allotted: 50 Marks
7	Course Objectives(CO): CO 1. To verify the truth tables of various logic gates CO 2. Develop proficiency in designing and implementing digital circuits. CO 3. Explore various components of digital systems, including processors, memory units, and input/output interfaces. CO 4. Develop skills in designing and creating relational databases. CO 5. Explore the principles of database querying using SQL. CO 6. Gain practical knowledge of transaction management and data control in database systems.
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Verify truth tables of various logic gates OC 2. Simplify given Boolean expressions and implement them using Logisim. OC 3. Design and validate the operation of various combinational circuits using Logisim. OC 4. Understand the behavior and applications of flip-flops in digital systems. OC 5. Design and implement expressions using multiplexers/demultiplexers in Logisim. OC 6. Create and maintain relational databases, applying normalization principles. OC 7. Write simple queries to MySQL related to String, Maths and Date Functions. OC 8. Create tables and insert/update/delete data, and query data in a relational DBMS using MySQL commands. OC 9. Handle data permissions
9	Modules:- Module 1 (30 hours): Digital Systems & Architecture – Practical Logic Gates Truth Table Verification: Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR) using Logisim. Boolean Expression Simplification: Simplify given Boolean expressions and realize them using Logisim. Half/Full Adder Design: Design and verify the operation of a half/full adder using Logisim. Half/Full Subtractor Design: Design and verify the operation of a half/full subtractor using Logisim. 4-Bit Magnitude Comparator: Design a 4-bit magnitude comparator using combinational circuits in Logisim. Flip-Flop Implementation: Verify the operation of flip-flops (e.g., D, JK) using logic gates in Logisim. Counter Operation Verification: Verify the operation of a counter using Logisim. 4-Bit Shift Register Operation: Verify the operation of a 4-bit shift register using Logisim. Multiplexer/Demultiplexer Design: Design and implement expressions using multiplexers/demultiplexers in Logisim. 3-Bit Binary Ripple Counter:

	Design and implement a 3-bit binary ripple counter using JK flip-flops in Logisim. The above practical can be performed using any open source simulator (like Logisim) (Download it from https://sourceforge.net/projects/circuit/)	
	Module 2 (30 hours):	
	Database Management System – Practical	
	Conceptual Design Using ER Diagrams: Identify entities, attributes, keys, and relationships. Apply generalization and specialization. Database Management Operations: View all databases, create a database, view all tables in a database, create tables with and without constraints, perform CRUD operations. Table Management Operations: Alter a table, drop/truncate/rename tables, perform backup/restore operations on a DB. Basic Queries and Aggregate Functions: Execute simple queries and utilize aggregate functions (e.g., COUNT, SUM, AVG). Advanced Query Functions: Utilize date, string, and math functions in queries. Join Queries: Execute inner and outer join queries. Subqueries: Apply subqueries with IN and EXISTS clauses. ER Model to Relational Model Conversion and Normalization: Convert ER model to a relational model and apply normalization up to 3rd Normal Form. Views: Create views with and without check options, drop views, select data from views. Data Control Language (DCL) Statements: Implement DCL statements for granting and revoking permissions. Demonstrate COMMIT and ROLLBACK statements. These experiments can be implemented using a database management system like MySQL	
10	Text Books 1. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010 2. Murach's MySQL, Joel Murach, 3rd Edition, 3rd Edition, 2019	
11	Reference Books 1. MySQL: The Complete Reference, VikramVaswani , McGraw Hill, 2017 2. Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease, Ashwin Pajankar, BPB Publications, 2020	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%
13	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam
	Total: 20 marks	Total: 30 Marks

14	Format of Question Paper:		
	Total Marks: 30		Duration: 2 Hours
	Question	Practical Question Based On	Marks
	Q.1	Module 1	12
	Q.2	Module 2	12
	Q.3	Viva	06

Open Electives (OE)

Name of the Course: Google Office Automation

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: Google Office Automation is the use of cloud-based Google productivity tools—including Google Docs, Sheets, Slides, Forms, Gmail, and Keep—to automate and streamline office tasks. It allows users to create, edit, organize, and share documents, manage data, create presentations, conduct surveys, manage emails, and track tasks efficiently. The automation aspect ensures repetitive tasks are simplified, collaboration is enhanced, and workflows are more productive. Relevance: Google Office Automation is highly relevant in modern educational and professional environments. It addresses the need for remote collaboration, paperless documentation, real-time updates, and centralized data management. With organizations increasingly moving towards digital workflows, knowledge of Google Office tools has become essential for students and professionals. Usefulness: Enables real-time collaboration among multiple users across different locations. Provides cloud-based storage, ensuring access from any device with internet connectivity. Reduces errors in documentation and calculations with automated functions. Streamlines communication and scheduling through Gmail and Calendar integration. Supports data collection and analysis with Forms and Sheets. Enhances task management and reminders via Keep. Application: Google Docs for reports, memos, letters, and proposals. Google Sheets for calculations, charts, data analysis, and reporting. Google Slides for seminars, project presentations, and business pitches. Google Forms for quizzes, surveys, registration forms, and feedback collection. Gmail and Calendar for official correspondence, scheduling, and reminders. Google Keep for notes, to-do lists, and reminders. Interest: User-friendly and interactive interface attracts learners. Cloud collaboration fosters teamwork and real-world project engagement. Integration of multiple tools provides a comprehensive productivity platform. Access to advanced features like add-ons, templates, and automation keeps users engaged.

		Connection with Other Courses: Hands-on exposure to cloud tools enhances practical IT skills. Streamlines communication, reporting, and scheduling. Google Sheets and Forms support data collection, organization, and analysis. Tools enable teamwork, document sharing, and task tracking in project-based courses. Demand in the Industry: Organizations increasingly rely on cloud-based office automation for efficient workflow. Startups, corporates, educational institutions, and NGOs widely use Google Office tools. High demand for employees proficient in office automation and digital collaboration platforms. Job Prospects: Office executive, administrative assistant, project coordinator. MIS executive, junior data analyst, survey coordinator. Content coordinator, documentation specialist, report analyst. Project assistant, office manager, team collaborator.
2	Vertical:	OE
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To introduce students to Google Docs, Sheets, Slides, Forms, Gmail/Outlook, and Keep for office automation. CO 2. To develop skills in creating, editing, formatting, and managing digital documents and spreadsheets. CO 3. To enable students to create professional presentations and collaborative projects using Google Slides. CO 4. To provide knowledge of email management, calendar scheduling, and task organization using Gmail/Outlook. CO 5. To train students in designing online forms, surveys, and collecting responses using Google Forms. CO 6. To enhance productivity and collaboration using Google Keep for notes, reminders, and task management.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Create, edit, format, and manage documents and spreadsheets efficiently using Google Docs and Sheets. OC 2. Develop professional and engaging presentations using Google Slides. OC 3. Communicate effectively and manage emails, calendars, and tasks using Gmail/Outlook. OC 4. Design, share, and analyze online forms and surveys using Google Forms. OC 5. Organize notes, set reminders, and collaborate effectively using Google Keep. OC 6. Demonstrate proficiency in cloud-based office tools for academic, personal, and professional productivity.	
9	Modules:- Module 1 (15 hours):	

	Google Docs: Introduction to Google Docs, Creating and Editing Documents, Organizing and Managing Documents, Advanced Formatting Techniques, Collaboration and Communication, Add-ons and Templates, Working Offline and Synchronization, Advanced Features (Optional, depending on the course level) Google Sheets: Introduction to Google Sheets, Data Entry and Formatting, Basic Formulas and Functions, Data Analysis and Manipulation, Data Visualization, Collaboration and Sharing, Importing and Exporting Data Google Slides: Introduction to Google Slides, Working with Content, Enhancing Presentations, Collaboration and Sharing, Advanced Features, Final Project and Presentation	
	Module 2 (15 hours):	
	Gmail / Outlook: Introduction to Microsoft Outlook, Managing Email, Contacts and Address Book, Calendar and Scheduling, Tasks and To-Do List, Notes and Journal, Outlook Data Management, Advanced Outlook Features, Outlook on Mobile Devices, Troubleshooting and Tips Google Form: Introduction to Google Form, Creating a Form, Adding Questions, Form Customization, Form Settings, Response Collection, Form Sharing, Collaborating on Forms, Advanced Form Features. Google Keep: Introduction to Google Keep, Creating and Managing Notes, Note Organization, Collaboration and Sharing, Advanced Features, Integrations, Tips and Tricks, Tips and Tricks, Troubleshooting and Support	
10	Text Books Google Workspace For Dummies – Paul McFedries, 2024 (approx published year based on latest edition availability) The Google Workspace Bible: [14 in 1] The Ultimate All-in-One Guide – Robert G. Pascall, 2023 Google Sheet Functions: A Step-by-Step Guide – Barrie Roberts, 2020 (focus on Sheets but relevant for automation and productivity)	
11	Reference Books Google Workspace: The Complete Beginner's Guide Jason Cannon (2022) A practical reference covering key Google Workspace apps, step-by-step. Mastering the Suite for Productivity & Collaboration Chris Betcher (2021) Covers collaboration, Drive integration, and automation workflows. Gmail & Google Workspace: Essential Skills for Business Communication William R. Stanek (2020) Emphasis on email, scheduling, productivity, and integrated workflows.	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.
	Total: 20 marks	Total: 30 Marks

14	Format of Question Paper:			
	Total Marks: 30		Duration: 1 Hour	
	Question	Based On	Options	Marks
	Q.1	Module 1	Any 2 out of 4	10
	Q.2	Module 2	Any 2 out of 4	10
	Q.3	Module 1 & 2	Any 2 out of 4	10

Name of the Course: Multimedia

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: This course introduces students to the fundamentals of multimedia, encompassing text, audio, image, video, and animation, along with tools and techniques used for creating, editing, and authoring multimedia content. Students will learn how digital media transforms conventional media and how to apply multimedia concepts in real-world applications. Relevance: The rise of digital media and the Internet has increased the demand for professionals who can design and manage multimedia content. Understanding multimedia fundamentals is essential for careers in web design, content creation, digital marketing, and entertainment industries. Usefulness: Students will gain: • Knowledge of multimedia components and formats • Skills to create and edit text, audio, image, and video content • Ability to use multimedia authoring tools • Understanding of compression, file formats, and digital media standards Application: Web and Internet multimedia applications Digital media production (audio, video, images) Animation and motion graphics E-learning and interactive applications Advertising and entertainment industries Interest: This course engages students through hands-on practical exercises, including audio/video editing, image processing, and multimedia authoring, fostering creativity and technical skills. Connection with Other Courses: Computer Graphics, Web Development and Design, Digital Signal Processing, Animation and Game Design, Audio and Video Engineering Demand in the Industry: There is a growing demand for professionals skilled in digital media creation, animation, multimedia authoring, and web design, as businesses increasingly rely on multimedia for marketing,

		entertainment, and education. Job Prospects: Multimedia Designer, Web Designer, Video Editor, Audio Engineer Animator, Content Creator, E-learning Developer
2	Vertical:	OE
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO1. To understand the components of multimedia and its applications. CO2. To study computer fonts, hypertext, and digital text techniques. CO3. To learn fundamentals of audio, its digitization, compression, and transmission. CO4. To study image fundamentals, colour science, image processing, and editing techniques. CO5. To understand video and animation principles, standards, recording, and editing. CO6. To gain knowledge of multimedia authoring tools and techniques.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC1. Explain the components of multimedia and transition from conventional to digital media. OC2. Identify and apply different types of fonts and hypertext techniques in digital projects. OC3. Demonstrate audio fundamentals, digitization, file formats, and sound editing. OC4. Apply image fundamentals, colour science, and basic image processing techniques. OC5. Edit and compress video content, and understand video standards and formats. OC6. Create animations using cell animation, computer animation, and morphing techniques. OC7. Use multimedia authoring tools such as Macromedia Director and Flash. OC8. Integrate audio, video, and image elements in a multimedia project. OC9. Demonstrate practical skills in digital media production for industry applications.	
9	Modules:- Module 1 (15 hours):	
	Introduction to Multimedia: What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media.	
	Computer Fonts and Hypertext: Usage of text in Multimedia, Families and faces of fonts, outline fonts, bitmap fonts International character sets and hypertext, Digital fonts techniques.	
	Audio fundamentals and representations Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.	
	Module 2 (15 hours):	
	Image fundamentals and representations Colour Science , Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats :GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF,	

	Basic Image Processing [Can Use Photoshop], Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching Video and Animation Video Basics , How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: CellAnimation, Computer Animation, Morphing. Multimedia Authoring Multimedia Authoring Basics, Some Authoring Tools, Macromedia Director & Flash.																		
10	Text Books 1. Tay Vaughan, <i>Multimedia: Making It Work</i> , McGraw-Hill. 2. Ralf Steinmetz & Klara Nahrstedt, <i>Multimedia: Computing, Communications and Applications</i> , Pearson. 3. Ze-Nian Li, Mark S Drew, <i>Fundamentals of Multimedia</i> , Springer.																		
11	Reference Books 1. John F. Koegel Buford, <i>Multimedia Systems</i> , Pearson. 2. Ranjan Parekh, <i>Principles of Multimedia</i> , McGraw-Hill. 3. Mark J. P. Wolf, <i>Encyclopedia of Video Games</i> , Greenwood. 4. K. Andleigh & K. Thakkar, <i>Multimedia Systems Design</i> , PHI.																		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%																	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.																	
	Total: 20 marks	Total: 30 Marks																	
14	Format of Question Paper: Total Marks: 30 Duration: 1 Hour <table><tr><th>Question</th><th>Based On</th><th>Options</th><th>Marks</th></tr><tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr></table>			Question	Based On	Options	Marks	Q.1	Module 1	Any 2 out of 4	10	Q.2	Module 2	Any 2 out of 4	10	Q.3	Module 1 & 2	Any 2 out of 4	10
Question	Based On	Options	Marks																
Q.1	Module 1	Any 2 out of 4	10																
Q.2	Module 2	Any 2 out of 4	10																
Q.3	Module 1 & 2	Any 2 out of 4	10																

Vocation Skill Course (VSC)

Name of the Course: Python Programming - Practical

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: Python is a powerful, high-level, and versatile programming language widely used in software development, web applications, automation, data science, artificial intelligence, cybersecurity, and cloud computing. This course introduces students to Python programming from basic programming concepts to advanced application development using Object-Oriented Programming, database connectivity, networking, graphical user interfaces, and data analysis libraries.

		Relevance: Python has become one of the most popular programming languages across academia and industry due to its simplicity, readability, portability, and extensive library support. This course equips students with essential programming and application development skills required for modern Computer Science and Information Technology careers. Usefulness: ● Develops strong programming and problem-solving skills. ● Provides practical knowledge of Python programming. ● Builds expertise in Object-Oriented Programming concepts. ● Introduces database programming, networking, GUI development, and multithreading. ● Develops skills in data analysis and visualization using Python libraries. Application: The knowledge gained from this course can be applied in: ● Software and Desktop Application Development ● Web Application Development ● Database-Driven Applications ● Automation and Scripting ● Network Programming ● GUI-Based Applications ● Data Analysis and Visualization ● Scientific and Statistical Computing ● Artificial Intelligence and Machine Learning ● Internet of Things (IoT) Applications Interest: The course emphasizes practical learning through laboratory exercises and real-world programming assignments. Students gain experience in developing interactive applications, solving computational problems, and working with industry-standard Python libraries, making learning engaging and application-oriented. Connection with Other Courses: This course has strong interdisciplinary connections with: ● Programming Fundamentals ● Data Structures ● Database Management Systems ● Operating Systems
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		• Computer Networks • Software Engineering • Web Technologies • Artificial Intelligence • Machine Learning • Data Science • Cloud Computing • Cyber Security • Internet of Things (IoT) Demand in the Industry: Python is among the world's most in-demand programming languages and is extensively used by technology companies, startups, financial institutions, healthcare organizations, research laboratories, and government sectors. Professionals skilled in Python are highly sought after in software development, automation, cloud computing, cybersecurity, artificial intelligence, data science, and analytics. Job Prospects: After successful completion of this course, students can pursue careers as: • Python Developer • Software Developer • Application Developer • Backend Developer • Web Developer • Data Analyst • Data Science Associate • Machine Learning Associate • AI Developer (Entry Level) • Database Programmer • Automation Engineer • Network Programmer • GUI Application Developer • Test Automation Engineer • Technical Support Engineer • Research Assistant • IoT Application Developer
2	Vertical:	SEC
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): After successful completion of this course, students will be able to: CO1: Understand the fundamentals of Python programming, including variables, operators, control structures, functions, data structures, file handling, regular expressions, and date-time operations.	

	CO2: Apply Object-Oriented Programming concepts such as classes, objects, inheritance, polymorphism, abstraction, and multithreading to develop modular Python applications. CO3: Design and implement database-driven, network-based, and GUI applications using Python and MySQL while applying appropriate exception handling techniques. CO4: Utilize Python libraries including NumPy, Pandas, Matplotlib, and SciPy for numerical computing, data manipulation, visualization, and basic statistical analysis. CO5: Develop real-world Python applications by integrating programming concepts, object-oriented principles, database connectivity, networking, graphical interfaces, and data science tools.
8	Course Outcomes (OC): After successful completion of this course, students will be able to: OC1: Develop Python programs using procedural programming concepts, control structures, functions, arrays, strings, collections, file handling, regular expressions, and date-time modules. OC2: Design and implement object-oriented applications using classes, inheritance, polymorphism, abstract classes, interfaces, and multithreading in Python. OC3: Develop database-oriented, network-enabled, and GUI-based applications using Python while implementing robust exception handling mechanisms. OC4: Analyze, manipulate, and visualize data using Python libraries such as NumPy, Pandas, Matplotlib, and SciPy to solve computational and analytical problems. OC5: Demonstrate the ability to design, develop, test, and deploy practical Python applications that address real-world software development and data-driven computing challenges.
9	Modules:- Module 1 (30 hours): Overview and Basic Elements of Python Programming: ● Perform a Python program to demonstrate basic features of Python, execution of a Python program, use of comments, docstrings, and data types. ● Perform a Python program to demonstrate variables, input function, output statements, and command line arguments. ● Perform a Python program to demonstrate different types of operators (arithmetic, relational, logical, assignment) and precedence of operators. Control Statements: ● Perform a Python program to demonstrate conditional statements using if, if-else, and if-elif-else. ● Perform a Python program to demonstrate looping statements using while loop and for loop. ● Perform a Python program to demonstrate loop control statements such as break, continue, pass, assert, and return. ● Perform a Python program to demonstrate nested loops and the use of the else suite with loops. Arrays: ● Perform a Python program to create arrays using NumPy and demonstrate indexing and slicing. ● Perform a Python program to demonstrate basic array operations and

mathematical operations on arrays.

- Perform a Python program to demonstrate array processing, aliasing of arrays, and array attributes such as dimensions and shape.

Functions:

- Perform a Python program to demonstrate function definition and function call, including returning single and multiple values.
- Perform a Python program to demonstrate built-in functions, recursive functions, and lambda (anonymous) functions.
- Perform a Python program to demonstrate parameters and arguments, pass-by-object reference, and the difference between a function and a method.

Strings:

- Perform a Python program to perform string operations, including creating strings, string functions, and formatting strings.
- Perform a Python program to find the number of characters and words in a string and insert a substring into a given string.

Working with List & Tuples:

- Perform a Python program to demonstrate list creation, list methods, list operations, slicing, and nested lists.
- Perform a Python program to demonstrate tuples and tuple functions, including tuple packing and unpacking.

Working with Dictionaries:

- Perform a Python program to create a dictionary and perform dictionary operations, including operators, methods, and traversal using a for loop.

Files in Python:

- Perform a Python program to open a text file, write data into it, and close the file.
- Perform a Python program to read the contents of a text file using different file modes (r, w, a).
- Perform a Python program to copy the contents of one text file into another text file.
- Perform a Python program to perform file read and write operations using the with statement.
- Perform a Python program to create and read a binary file.
- Perform a Python program to demonstrate seek() and tell() methods on a binary file.
- Perform a Python program to perform random accessing of data in a binary file using seek().
- Perform a Python program to store and retrieve Python objects using the pickle module.
- Perform a Python program to compress files using the zipfile module and extract the contents of a zip file.

	Regular Expressions: ● Perform a Python program to demonstrate the basics of Regular Expressions using the re module (search(), match(), findall()). ● Perform a Python program to demonstrate sequence characters in Regular Expressions such as \d, \w, \s, and \D. ● Perform a Python program to demonstrate special characters in Regular Expressions like ., *, +, ?, ^, and \$. ● Perform a Python program to validate input data using Regular Expressions (email ID or mobile number). ● Perform a Python program to search and extract patterns from a text file using Regular Expressions. ● Perform a Python program to retrieve information from an HTML file such as email IDs, hyperlinks, or tags using Regular Expressions Date And Time in Python: ● Perform a Python program to display the current date and time using the datetime module. ● Perform a Python program to demonstrate date and time formatting using the strftime() method. ● Perform a Python program to combine date and time and compare two dates to find the earlier and later date. ● Perform a Python program to sort a list of dates and calculate the time taken by a program using the time module. ● Perform a Python program to display a calendar for a given month and year using the calendar module.
	Module 2 (30 hours):
	Introduction to OOPs ● Perform a Python program to demonstrate the limitations of the Procedure Oriented Approach and explain how OOP overcomes these problems. ● Perform a Python program to demonstrate the basic features of Object Oriented Programming such as encapsulation, abstraction, inheritance, and polymorphism Classes and Objects ● Perform a Python program to create a simple class and object and access class members using the self variable. ● Perform a Python program to demonstrate different types of variables (instance variables and class variables). ● Perform a Python program to demonstrate different types of methods (instance method, class method, and static method). ● Perform a Python program to implement constructors and destructors using __init__() and __del__() methods. ● Perform a Python program to pass members of one class to another class (object as argument). Inheritance and Polymorphism

- Perform a Python program to demonstrate different types of inheritance (single, multilevel, multiple, hierarchical).
- Perform a Python program to demonstrate constructors in inheritance and overriding superclass constructors using the super() method.
- Perform a Python program to demonstrate method overriding in inheritance.
- Perform a Python program to demonstrate polymorphism using function overriding.
- Perform a Python program to demonstrate Duck Typing in Python.
- Perform a Python program to implement operator overloading using magic methods.
- Perform a Python program to demonstrate method overloading using default arguments or variable-length arguments.

Abstract Classes and Interfaces

- Perform a Python program to demonstrate an abstract class and abstract method using the abc module.
- Perform a Python program to implement interfaces in Python using abstract base classes.

Threads in Python

- Perform a Python program to create and execute a thread using the threading module.
- Perform a Python program to demonstrate single tasking and multitasking using threads.
- Perform a Python program to demonstrate thread synchronization using locks.
- Perform a Python program to demonstrate deadlock in threads and explain how it can be avoided.

Working with Databases (MySQL using Python)

- Perform a Python program to establish a connection with a MySQL database using mysql-connector.
- Perform a Python program to create a database and tables in MySQL through Python.
- Perform a Python program to insert records into a MySQL table using Python.
- Perform a Python program to retrieve and display records from a MySQL table.
- Perform a Python program to update records in a MySQL table.
- Perform a Python program to delete records from a MySQL table.
- Perform a Python program to perform CRUD operations (Create, Read, Update, Delete) using Python and MySQL.

Exceptions and Exception Handling

- Perform a Python program to demonstrate different types of errors (syntax error, runtime error, logical error).
- Perform a Python program to demonstrate exception handling using try, except, else, and finally.
- Perform a Python program to handle multiple exceptions in a single program.
- Perform a Python program to create and raise a user-defined exception.

	- Perform a Python program to log exceptions using the logging module. Networking Concepts and Applications - Perform a Python program to demonstrate basic TCP/IP client-server communication. - Perform a Python program to demonstrate User Datagram Protocol (UDP) communication. - Perform a Python program to explain FTP architecture and perform file upload/download using Python. - Perform a Python program to perform basic web page operations such as fetching content using urllib or requests. - Perform a Python program to send a simple email using SMTP protocol. Graphical User Interface (GUI) Using Python - Perform a Python program to create a basic GUI application using Tkinter. - Perform a Python program to demonstrate widget classes such as Label, Button, Entry, Text, and Checkbutton. - Perform a Python program to demonstrate layout managers (pack, grid, and place). - Perform a Python program to demonstrate event handling using mouse and keyboard events. Data Science Tools - Perform a Python program to demonstrate creation and operations on NumPy arrays. - Perform a Python program to visualize data using Matplotlib (line plot, bar chart). - Perform a Python program to create and manipulate DataFrames using pandas. - Perform a Python program to perform basic statistical operations using SciPy.	
10	Text Books - Practical Programming: An Introduction to Computer Science Using Python 3, Paul Gries , Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf, 2nd Edition, 2014 - Programming through Python, M. T Savaliya, R. K. Maurya & G M Magar, Sybgen Learning India, 2020	
11	Reference Books - Python: The Complete Reference, Martin C. Brown, McGraw Hill, 2018 - Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2017	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%
13	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam
	Total: 20 marks	Total: 30 Marks

14	Format of Question Paper:		
	Total Marks: 30		Duration: 2 Hours
	Question	Practical Question Based On	Marks
	Q.1	Module 1	12
	Q.2	Module 2	12
	Q.3	Viva	06

Skill Enhancement Course (SEC)

Name of the Course: Web Development

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Skill Enhancement for Computer Practical Course encompassing Web Development offers a comprehensive and hands-on exploration of the core principles and technologies used to build modern, interactive, and user-friendly websites. This course is designed to provide students with a strong foundation in HTML, CSS, JavaScript, Ajax, Bootstrap, and php techniques essential for crafting visually appealing and responsive web interfaces. Through structured practicals and real-world design tasks, students gain a holistic understanding of layout creation, styling, interactivity, and usability. The course prepares learners to transform ideas into functional web pages while developing the creative and technical skills required for professional web development. Relevance: In today's digital-first world, Designing Web Pages is highly relevant as it equips students with the skills to create responsive, user-friendly, and visually appealing online interfaces. This practical course blends creativity with core web technologies like HTML5, CSS3, Bootstrap, and JavaScript, Ajax, PHP giving learners a strong foundation to design modern and effective web pages and Web Application Development. Usefulness: This course is immensely useful for students aspiring to build strong front-end development skills. By integrating essential web technologies such as HTML5, CSS, Bootstrap, JavaScript, and responsive design principles and server-side development like PHP with mySql Database connectivity. Students gain the ability to create modern, interactive, and user-centric web interfaces and Backend connectivity. This

		practical foundation empowers them to design, implement, and refine real-world web pages effectively. Application: The skills acquired in this practical course find direct application in building modern, visually appealing, and fully functional web interfaces. Students learn to structure content using HTML5, enhance presentation with CSS, apply responsive layouts through Bootstrap, and incorporate interactivity using JavaScript. These abilities enable them to design user-friendly websites that meet real-world standards and adapt seamlessly to diverse devices and user needs.” Interest: The Web Development Practical Course is crafted to spark student interest through a highly interactive and creative learning experience. By engaging in hands-on activities that involve crafting web layouts, styling pages, adding dynamic features, building responsive interfaces and server to Backend connectivity, students naturally develop curiosity and enthusiasm for web development. This practical exposure nurtures a deeper appreciation for the art and logic behind modern web design. Connection with Other Courses: This practical course forms an essential link to several other subjects within the computer science curriculum. By building strong fundamentals in HTML, CSS, JavaScript, Ajax, responsive design and PHP, it directly supports advanced courses such as Web Programming, Software Engineering, UI/UX Design, Database Management Systems, and Full-Stack Development. The concepts learned here create a solid foundation, enabling students to understand how front-end design integrates with backend logic, data handling, and overall software architecture.” Demand in the Industry: Skilled web designers and front-end developers are in high demand across the tech industry. Companies in fields such as software development, e-commerce, digital marketing, media, and IT services actively seek professionals who can create responsive, visually appealing, and user-friendly web interfaces. With the growing shift toward digital platforms, the ability to design modern and interactive web pages has become a highly valued and essential industry skill. Job Prospects: Graduates of this practical course have strong job prospects in roles centered around front-end development and web interface creation. Potential job titles include Web Designer,
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		Front-End Developer, UI Developer, UX/UI Designer, WordPress Developer, and Web Content Specialist. With businesses increasingly relying on impactful digital presence, students equipped with modern web design skills are well-prepared to secure opportunities across tech companies, startups, digital agencies, and freelance markets.
2	Vertical:	SEC
3	Type:	Practical
4	Credits:	2 credits (1 credit = 30 Hours of Practical work in a semester)
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. Understand the fundamentals of HTML and HTML5 to create well-structured web pages. CO 2. Develop proficiency in applying basic and advanced CSS techniques to style and layout web pages effectively. CO 3. Learn to use Bootstrap and advanced Bootstrap components to build responsive and mobile-friendly interfaces. CO 4. Gain the ability to implement interactivity using JavaScript and advanced JavaScript concepts. CO 5. Acquire practical skills in integrating front-end design with PHP for dynamic content handling. CO 6. Build complete, functional, and visually appealing web pages by combining multiple front-end and back-end technologies.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Create well-structured static web pages using HTML and HTML5 elements. OC 2. Apply basic and advanced CSS techniques to style, format, and enhance the appearance of web pages. OC 3. Design responsive and mobile-friendly layouts using Bootstrap components and utilities. OC 4. Implement interactivity and dynamic behavior on web pages using JavaScript. OC 5. Use advanced JavaScript concepts to validate forms, manipulate the DOM, and enhance user experience. OC 6. Develop PHP scripts to handle server-side operations such as form processing and data management. OC 7. Integrate front-end pages with backend scripts to create functional and dynamic web interfaces. OC 8. Build complete web page modules incorporating HTML, CSS, JavaScript, Bootstrap, and PHP. OC 9. Apply good coding practices and web standards to develop clean, efficient, and user-friendly web pages.	

9	Modules:- Module 1 (30 hours):
	Web Technologies – Practical Logic ● Create a basic HTML webpage using headings, paragraphs, lists, links, and images to design a "Home Page" for your project topic (e.g., college portal, e-commerce, library system). ● Design an HTML table and a registration/login form (using <code><form></code>, <code><input></code>, <code><select></code>, <code><textarea></code>) for the same project, to be used as the master form for later practicals. ● Redesign the Home Page using HTML5 semantic tags (<code><header></code>, <code><nav></code>, <code><section></code>, <code><article></code>, <code><footer></code>) and embed audio/video/canvas elements. ● Apply internal and external CSS to style the HTML page created in Aim 1–3 (fonts, colors, backgrounds, borders). ● Use CSS Box Model, positioning (relative/absolute/fixed), and Flexbox to properly lay out the navigation bar and page sections. ● Apply CSS3 features — transitions, animations, and media queries — to make the same page responsive across devices. ● Convert the existing page into a responsive layout using Bootstrap's grid system (container, row, col) and a Bootstrap navbar. ● Enhance the UI using Bootstrap components — cards, buttons, modals, and carousel — to display project content (e.g., product listings, notices). ● Redesign the registration/login form (refer from previous practicals) using Bootstrap form classes and validation styling for a professional look.
	Module 2 (30 hours): ● Use JavaScript to perform DOM manipulation — change text, styles, and content of the Home Page dynamically on button click/events. ● Write JavaScript form validation for the registration form (empty fields, email format, password match, number checks) before submission. ● Use JavaScript to create, parse, and display JSON data (sample records) dynamically inside an HTML table on the page. ● Use AJAX (XMLHttpRequest or Fetch API) to load static text/JSON data from a local file into the webpage without reloading it. ● Use AJAX to fetch JSON data and dynamically populate the HTML table with that data. ● Write basic PHP scripts covering variables, control structures, and functions; embed PHP output into the existing HTML page. ● Handle the registration form using PHP — capture form data via GET/POST and display submitted values back to the browser. ● Create a MySQL database and table for your project (e.g., <code>students</code>, <code>products</code>), and establish PHP–MySQL connectivity using <code>mysqli</code>/PDO. ● Insert the registration form data into the MySQL database table created using a PHP insert script. ● Fetch records from the MySQL database using PHP and display them in the HTML table on the browser, formatted using Bootstrap/CSS styling. ● Build a complete dynamic front-end interface for your project topic that uses AJAX calls to PHP scripts to Insert, Fetch, Update, and Delete records from MySQL, updating the HTML table in real time without page

	reload — integrating all HTML5, CSS, Bootstrap, JS validation, AJAX, and PHP-MySQL work from previous practicals into one working module.													
10	Text Books 1. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010 2. Murach's MySQL, Joel Murach, 3rd Edition, 3rd Edition, 2019													
11	Reference Books 1. MySQL: The Complete Reference, VikramVaswani , McGraw Hill, 2017 2. Learn SQL with MySQL: Retrieve and Manipulate Data Using SQL Commands with Ease, Ashwin Pajankar, BPB Publications, 2020													
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%												
	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
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14	Format of Question Paper: Total Marks: 30 Duration: 2 Hours <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 20%;">Question</th><th style="width: 60%;">Practical Question Based On</th><th style="width: 20%;">Marks</th></tr> </thead> <tbody> <tr> <td>Q.1</td><td>Module 1</td><td>12</td></tr> <tr> <td>Q.2</td><td>Module 2</td><td>12</td></tr> <tr> <td>Q.3</td><td>Viva</td><td>06</td></tr> </tbody> </table>		Question	Practical Question Based On	Marks	Q.1	Module 1	12	Q.2	Module 2	12	Q.3	Viva	06
Question	Practical Question Based On	Marks												
Q.1	Module 1	12												
Q.2	Module 2	12												
Q.3	Viva	06												

Name of the Course: AI-Generated Tools & Numerical Computing with NumPy - Practical

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: This course introduces students to modern AI-generated tools and their applications in content creation, programming, research, and data analysis, along with numerical computing using NumPy . The course enables learners to effectively use AI tools for productivity and problem-solving while building strong foundations in numerical computation using Python's powerful NumPy library. Relevance: With the rapid adoption of Artificial Intelligence and data-driven technologies , understanding AI tools and numerical computation has become essential. This course

		bridges the gap between theoretical knowledge and practical application by exposing students to real-world AI tools and numerical data processing techniques. Usefulness: The course helps students: ● Improve productivity using AI-generated tools ● Enhance coding, debugging, and documentation skills ● Perform efficient numerical computations and data analysis ● Develop ethical awareness in AI usage ● Build foundational skills for advanced AI and data science courses Application: Content generation (text, images, audio, video) Software development and debugging Data analysis and numerical simulations Academic research and report preparation Automation and productivity enhancement Engineering and scientific computations Interest: Hands-on exposure to AI tools and NumPy makes learning engaging and interactive. Students experience real-time problem solving, automation, and numerical analysis, increasing curiosity and interest in emerging technologies. Connection with Other Courses: This course complements: ● Python Programming ● Data Structures ● Data Science & Analytics ● Artificial Intelligence ● Machine Learning ● Software Engineering ● Research Methodology Demand in the Industry: AI tools and numerical computing skills are in high demand across industries including IT, finance, healthcare, education, manufacturing, and research. Organizations seek professionals who can efficiently use AI tools and process large datasets.
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		Job Prospects: After completing this course, students can pursue roles such as: ● AI Tool Specialist ● Python / NumPy Developer ● Data Analyst ● Junior Data Scientist ● Automation Engineer ● Research Assistant ● Software Developer
2	Vertical:	VEC
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO1. To introduce AI-generated tools and their practical applications. CO2. To enable content creation using AI tools. CO3. To develop skills in AI-assisted programming, debugging, and documentation. CO4. To understand ethical considerations in AI usage. CO5. To build strong foundations in numerical computing using NumPy. CO6. To apply NumPy for efficient data processing and analysis.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC1. Identify and use different AI-generated tools effectively. OC2. Generate text, documents, presentations, and multimedia content using AI. OC3. Write, debug, and optimize code using AI tools. OC4. Perform research and data analysis with AI assistance. OC5. Apply ethical principles in the use of AI technologies. OC6. Create and manipulate NumPy arrays for numerical computation. OC7. Perform mathematical and statistical operations using NumPy. OC8. Use advanced NumPy techniques such as slicing, indexing, and ufuncs. OC9. Solve real-world numerical problems using NumPy efficiently	
9	Modules:-	
	Module 1 (30 hours)	
	AI-Generated Tools ● To understand different AI-generated tools and their uses ● To generate content using AI ● To use AI tools to generate documents and PPT ● To write and debug code using AI. ● To create flowchart and pseudocode using AI. ● To generate images using AI. ● To create audio/video content using AI. ● To perform topic research using AI ● To use AI for data analysis. ● To understand ethical AI usage	

	Module 2 (30 hours): Numerical Computing with NumPy													
	● Creation of one-dimensional and multi-dimensional NumPy arrays ● Array indexing, slicing, and sub-array extraction ● Exploring array attributes: shape, size, dimensions, and data type ● Performing arithmetic and basic operations on NumPy arrays ● Mathematical operations on arrays: sum, mean, min, max, standard deviation ● Array reshaping, flattening, and resizing ● Aliasing vs. copying of NumPy arrays ● Using universal functions (ufuncs) on arrays ● Boolean indexing and conditional selection of array elements ● Sorting arrays and searching elements													
10	Text Books 1. Travis E. Oliphant, <i>Guide to NumPy</i>, USA: CreateSpace Independent Publishing. 2. Wes McKinney, <i>Python for Data Analysis</i>, O'Reilly Media. 3. Jake VanderPlas, <i>Python Data Science Handbook</i>, O'Reilly Media.													
11	Reference Books 1. Sebastian Raschka, <i>Python Machine Learning</i>, Packt Publishing. 2. Al Sweigart, <i>Automate the Boring Stuff with Python</i>, No Starch Press. 3. Aurélien Géron, <i>Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow</i>, O'Reilly Media. 4. OECD, <i>Artificial Intelligence in Society</i>.													
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%												
13	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
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Q.2	Module 2	12												
Q.3	Viva	06												

Ability Enhancement Course (AEC)

Name of the Course: Modern Indian Language - I

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: A Soft & Hard Skills subject introduces the two crucial types of abilities for career success: Hard Skills are measurable, technical knowledge learned via training, while Soft Skills are personal traits like communication, teamwork, leadership that dictate how you work and interact, both being vital for technical proficiency and a positive, productive workplace. This subject explains their differences, provides examples and teaches how to develop and showcase both for job readiness and career growth. Relevance: Personality traits and interpersonal skills like communication, teamwork, problem-solving, critical thinking, and emotional intelligence. Essential for performing core job functions, getting hired, and demonstrating technical competence. Crucial for navigating the workplace, collaborating with others, leading teams, adapting to change, and achieving career growth beyond initial job acquisition. Usefulness: Hard skills get you in the door; soft skills help you succeed and advance. Companies want people who can not only do the technical work but also collaborate, communicate, and solve problems as part of a team. Strong soft skills are often what distinguishes good employees from great leaders, as they're harder to teach than many technical tools. Application: ❖ In Projects: Use hard skills (project management software) <i>with</i> soft skills (clear communication, motivation). ❖ In Presentations: Build slides with hard skills (data visualization) and deliver with soft skills (confidence, clarity). ❖ In Interviews: Discuss your technical qualifications (hard skills) while demonstrating emotional intelligence and adaptability (soft skills). Interest: Students can pinpoint their skill interests by observing their engagement in daily activities and extracurriculars: ● Hobbies to Soft Skills: Participating in team sports builds collaboration and leadership. Creative arts like drama or book clubs foster communication and public speaking. ● Hobbies to Hard Skills: Gaming can spark an interest in coding or UX design. Strategic games like chess or fantasy football develop analytical thinking and forecasting.

		● Volunteer Work: Engaging in community service often reveals a student's interest in empathy (soft) or project management (hard). Connection with Other Courses: Hard and soft skills are interconnected and mutually reinforcing across all courses and professions. Hard skills provide the technical knowledge, while soft skills enable their effective application and interaction with others, acting as a crucial complement. Hard skills are the specific, teachable, and measurable abilities required to perform a job or task (e.g., coding, financial analysis, a foreign language). They form the functional backbone of a discipline. Soft skills are the personal attributes and interpersonal abilities that determine how well you interact with others, solve problems, and adapt to situations (e.g., communication, leadership, critical thinking). They are transferable across all careers and roles. Strong soft skills optimize the application and impact of hard skills. For example, a brilliant software engineer needs teamwork skills to collaborate on projects, and a doctor requires empathy to effectively apply their medical expertise. Research has shown that a significant percentage of long-term job success is tied to well-developed soft skills. Demand in the Industry: In today's industry, employers demand a crucial blend of hard skills (technical, teachable abilities like coding, data analysis) and soft skills(interpersonal traits like communication, leadership, problem-solving) for overall career success, with soft skills often tipping the hiring decision and driving long-term growth, while hard skills get you the interview. Top in-demand skills shift yearly but generally favor technical fields (Software Dev, Python, AI) and core human abilities (Adaptability, Collaboration, Emotional Intelligence). Job Prospects: Technical competencies are currently dominated by digital transformation and data-driven roles. ●IT & Data Science: High demand for Python, Java, SQL, Cloud Computing (AWS/Azure), and Cybersecurity. Specialized roles in Generative AI modeling and Machine Learning are among the fastest-growing. ●Finance: Expertise in advanced financial modeling, risk management, and data visualization is essential as the sector adopts more automation. ●Marketing: Digital marketing strategy, SEO/SEM, and marketing automation are critical for brand growth. ●Healthcare: Beyond clinical knowledge, technical skills in telemedicine, medical data analysis, and electronic health record (EHR) management are highly valued. Soft skills are now considered "essential" by 93% of employers, with many valuing them over traditional
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		educational qualifications. ●Communication & Collaboration: The most sought-after skill across all Indian sectors, especially for client-facing and remote/hybrid work environments. ●Problem-Solving & Critical Thinking: Crucial for freshers to stand out in competitive entry-level markets. ●Adaptability & Growth Mindset: Highly prioritized as Indian companies undergo rapid technological shifts. ●Leadership & Emotional Intelligence: Essential for mid-to-senior management roles to guide teams and manage conflict. Job Market Trends in India (2025) ●Skills-First Hiring: 81% of organizations now prioritize specific skills over traditional degrees. ●Productivity Impact: Employers report that a lack of soft skills among candidates is a primary factor limiting company productivity. ●Faster Promotions: Professionals demonstrating both high technical proficiency and strong interpersonal skills receive promotions approximately 8% faster than those with technical skills alone. ●Soft Skill Training Careers: There is a growing niche for Soft Skill Trainers as organizations invest in grooming employees for better communication and work ethics.
2	Vertical:	AEC
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. Understand the significance and essence of a wide range of soft skills. CO 2. Learn how to apply soft skills in a wide range of routine social and professional settings CO 3. Learn how to employ soft skills to improve interpersonal relationships CO 4. Learn how to employ soft skills to enhance employability and ensure workplace and career success	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1.. Learners will be able to understand the importance and types soft skills OC 2. Learners will develop skills for Academic and Professional Presentations. OC 3. Learners will be able to understand Leadership Qualities and Ethics. OC 4. Ability to understand the importance of stress management in their academic & professional life.	
9	Modules:-Modern Indian Language - I Module 1 (15 hours): Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Soft Skill Development. Personality Development:Knowing Yourself,Positive Thinking,Physical Fitness Emotional Intelligence: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence,Skills to Develop Emotional Intelligence	

	Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels																		
	Module 2 (15 hours):																		
	Communication Today: Significance of Communication, GSC's 3M Model of Communication, Vitality of the Communication Process, Virtues of Listening, Fundamentals of Good Listening, Nature of Non-Verbal Communication, Need for Intercultural Communication, Communicating Digital World Components of effective communication and Communication Skills: Communication process and handling them, Composing effective messages, Non-Verbal Communication: its importance and nuances: Facial Expression, Posture, Gesture, Eye contact, appearance (dress code), Spoken English, Phonetics. Etiquette, Mannerism and Ethical Values: : Introduction, Professional Etiquette, Technology Etiquette, Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics																		
10	Text Books 1. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2017. 2. Soft Skills: An Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India																		
11	Reference Books 1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press 2. Business Communication, Shalini Kalia, Shailja Agrawal, Wiley India 3. Cornerstone: Developing Soft Skills, Sherfield, Pearson India																		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%																	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.																	
	Total: 20 marks	Total: 30 Marks																	
14	Format of Question Paper: Total Marks: 30 Duration: 1 Hour <table><tr><th>Question</th><th>Based On</th><th>Options</th><th>Marks</th></tr><tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr></table>			Question	Based On	Options	Marks	Q.1	Module 1	Any 2 out of 4	10	Q.2	Module 2	Any 2 out of 4	10	Q.3	Module 1 & 2	Any 2 out of 4	10
Question	Based On	Options	Marks																
Q.1	Module 1	Any 2 out of 4	10																
Q.2	Module 2	Any 2 out of 4	10																
Q.3	Module 1 & 2	Any 2 out of 4	10																

Value Education Course (VEC)

Name of the Course: Green IT and Sustainable Computing

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: Green IT focuses on the design, use, management, and disposal of information technology systems in an environmentally sustainable manner. The course introduces students to Green IT principles, environmentally responsible business practices, energy-efficient computing, green data centers, virtualization, cloud computing, and sustainable IT infrastructure. Relevance: The rapid growth of information technology has increased energy consumption and environmental concerns. Green IT helps students understand sustainable computing practices, carbon footprint reduction, and environmentally responsible business strategies essential for modern organizations. Usefulness: The course equips students with knowledge of sustainable IT infrastructure, energy-efficient computing, Green IT strategies, environmental regulations, and emerging technologies that support sustainable development. Application: Students can apply Green IT concepts in data center management, cloud computing, virtualization, energy-efficient hardware selection, IT infrastructure planning, and sustainable enterprise solutions. Interest: The course develops awareness of environmental sustainability while exploring modern technologies such as cloud computing, virtualization, smart devices, IoT, and green business practices. Connection with Other Courses: ● Green Computing ● Business Process Management ● Enterprise Resource Planning (ERP) ● Environmental Studies Demand in the Industry: Green IT professionals are increasingly required by IT companies, cloud service providers, data center operators, government organizations, and multinational corporations to implement sustainable IT practices and reduce operational costs.

		Job Prospects: ● Green IT Consultant ● Sustainability Analyst ● Energy Efficiency Analyst ● IT Infrastructure Executive ● Environmental Compliance Officer ● ESG (Environmental, Social & Governance) Associate
2	Vertical:	VEC
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO1. Understand the fundamentals of Green IT and sustainable computing. CO2. Explain Green IT strategies and environmentally responsible business practices. CO3. Analyze Green IT metrics, KPIs, and environmental performance measurement techniques. CO4. Study Green IT infrastructure including green hardware, data centers, and virtualization. CO5. Understand cloud computing, networking infrastructure, and energy-efficient IT services. CO6. Explore emerging Green IT technologies and sustainable computing solutions.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to: OC1. Explain Green IT concepts and sustainable enterprise practices. OC2. Evaluate Green IT strategies and environmental performance indicators. OC3. Recommend environmentally responsible IT infrastructure and Green IT assets. OC4. Apply Green IT technologies such as virtualization, cloud computing, and sustainable device management in real-world scenarios.	
9	Modules:- Module 1 (15 hours): Green IT Fundamentals: Business, Environment, and Green Enterprise Characteristics, Green Vision and Strategic Points, Green Value, Green IT Opportunity, Challenges of a Carbon Economy, Environmental Intelligence, Envisioning the Green Future Green IT Strategies: Green strategic alignment, Green IT Drivers-Cost, Regulatory and Legal, Sociocultural and Political, Business ecosystem, New market opportunities, Green IT Business Dimensions, KPIs in GreenStrategies Environmentally Responsible Business: Developing ERBS, Policies, Practices, and Metrics, Mobility and Environment, Green It Metrics and Measurements, Green IT Readiness and CMM, Context Sensitivity and Automation in Green IT Measures Module 2 (15 hours): Green Assets: Introduction, Green Assets, Green IT Hardware, Green Data Centers and ICT Equipment, Server and Data Strategy	

	Green Assets and emerging Trends: Data Servers Optimization and Virtualization, Physical Data Server Organization and Cooling, Cloud Computing and Data Centers, Networking and Communications Infrastructure, End-User Devices, Smart Meters in Real-Time, Managing Devices for Central Green Services, Devices and Organizational Boundaries for Measurements, Mobile Devices, and Sustainability		
10	Text Books 1. Green IT Strategies and Applications Using Environmental Intelligence, Bhuvan Unhelkar, CRC Press, 2016		
11	Reference Books 1. Emerging Green Technologies, Matthew N. O. Sadiku, Taylor and Francis (CRC Press), 2022 2. Sustainability Awareness and Green Information Technologies, Tomayess Issa, Springer, 2021		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		
	Duration: 1 Hour		
	Question	Based On	Options
	Marks		
Q.1	Module 1	Any 2 out of 4	10
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Indian Knowledge System

Name of the Course: Vedic Mathematics

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: Vedic Mathematics is a system of fast, mental calculation techniques derived from ancient Indian scriptures (the Vedas), systematized by Swami Bharati Krishna Tirtha in the 20th century, using 16 core <i>sutras</i> (formulas) to simplify arithmetic, algebra, and geometry, enabling quicker, more intuitive problem-solving and boosting mental agility by offering unified, easy-to-use methods for complex math problems. Relevance: Vedic Mathematics is relevant today for significantly boosting calculation speed, improving mental agility, and reducing math anxiety by using simple, interconnected <i>sutras</i> (formulas) to solve problems faster and more intuitively, making complex arithmetic, algebra, and even calculus more accessible for students, competitive exams (like CAT), and daily life, while

		also enhancing overall cognitive skills like memory and creativity. Usefulness: Vedic Mathematics is highly useful for boosting calculation speed and accuracy, improving mental agility, concentration, and memory, and reducing math anxiety by offering intuitive shortcuts (<u>sutras</u>) for complex problems, applicable in daily life, competitive exams (<u>like CAT/GRE</u>), and other math branches like algebra and geometry, fostering a deeper, more flexible understanding. It builds confidence by making math fun and less daunting. Key Usefulness Areas: • Speed & Accuracy: Quickly solve complex problems mentally (multiplication, squares, roots) without calculators, crucial for exams. • Cognitive Development: Enhances memory, focus, visualization, and problem-solving skills through mental math. • Reduces Math Anxiety: Simplifies concepts, making math engaging and boosting confidence, transforming it from a chore to a game. • Flexibility: Provides multiple methods to solve one problem, allowing choice and deeper conceptual understanding. • Broad Applicability: Techniques extend beyond arithmetic to algebra, geometry, calculus, and daily tasks like budgeting and time management. • Competitive Edge: Helps students excel in competitive exams by saving time and improving performance. While it doesn't replace core mathematical principles, Vedic Maths provides powerful mental tools and shortcuts, making calculations faster, boosting cognitive abilities, and increasing interest and confidence in mathematics for all ages Application: • Mental Math: Squaring numbers, multiplying large numbers, finding square roots quickly. • Algebra: Solving linear equations using direct, formula-based methods. • Competitive Exams: Saving valuable time in exams like the CAT by speeding up calculations. Interest: Vedic Mathematics sparks interest by making math fun, fast, and less stressful through ancient Indian shortcuts (sutras), boosting mental math, confidence, focus, and accuracy for exams like Olympiads, while also improving overall cognitive skills and number sense, making complex calculations feel like a game. It enhances creativity and intuition, bridging gaps for slow learners and making math engaging for everyone from young students (Grade 3+) to adults. Who Finds it Interesting? • Students (Grades 3+): Especially those preparing for competitive exams.
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		● Parents & Teachers: As a tool to help children. ● Anyone: Seeking to improve number sense and mental math. Connection with Other Courses: Vedic Mathematics has strong connections to various academic and professional fields beyond general mathematics, primarily by enhancing calculation speed, logical thinking, and pattern recognition. Its principles are used in subjects such as: ● Science and Engineering: As mathematics is considered the language of science, Vedic principles can be applied in various scientific and engineering contexts. ○ Digital Signal Processing (DSP): The "Vertically and crosswise" (Urdhva Tiryagbhyam) sutra is used in the design of efficient multipliers for DSP algorithms, which are essential for audio/video processing and noise filtering applications. ○ Computer Science and AI: Researchers have explored the use of Vedic mathematics principles in artificial intelligence, coding, and the implementation of algorithms like the Fast Fourier Transform (FFT) to make computations faster and more efficient. ○ Quantum Computing: Potential areas of use for Vedic approaches also include quantum computing. ○ Cryptography and Cybersecurity: The sutras can contribute to developing efficient encryption and decryption algorithms for secure internet transactions. ● Commerce and Finance: The ability to perform rapid mental calculations is highly useful in fields requiring quick numerical analysis. ○ Numerical Analysis: Principles can be applied in finance, data analysis, and engineering to optimize numerical computations. ○ Accounting and Business: Everyday applications include calculating interest rates, taxes, investments, and performing quick mental estimates for business decisions. ● Research and Philosophy: ○ Mathematical Research: The underpinnings of Vedic methods connect to core areas like algebra, number theory, and discrete mathematics, which can be studied in academic research settings. ○ Linguistic and Philosophical Studies: The relationship between mathematical logic and the Sanskrit sutras offers a bridge between ancient knowledge and modern study. ● Competitive Exams and Education: The primary application for many students is gaining an edge in aptitude tests and examinations. ○ Exam Preparation: Techniques for speed and accuracy are extremely beneficial for competitive exams like JEE, SAT, GMAT, and UPSC, where
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		time management is crucial. ○ Pedagogy and Psychology: Integrating Vedic Mathematics into school curricula has shown benefits in reducing "math phobia," improving student engagement, confidence, memory, and logical reasoning skills. Demand in the Industry: The primary demand for Vedic Mathematics is in the education and edtech industries, particularly in teaching, content creation, and competitive exam coaching. In technical industries like engineering and finance, the demand is indirect, mainly for the underlying principles of computational efficiency in algorithm design and data analysis. Demand in the Education Industry The demand for Vedic Mathematics in education is high and growing, both in India and globally. ● Teaching and Tutoring: This is the most significant career path. There is a rising need for qualified teachers and tutors in schools, coaching centers, and as independent online/offline instructors. ● Competitive Exam Coaching: The techniques for speed and accuracy in mental calculations are highly valued for entrance exams like the CAT, GMAT, SAT, and various banking or government exams, leading to demand for specialized coaches. ● Content Creation: Opportunities exist for content writers, authors, and curriculum developers to create books, online courses, and digital materials for edtech platforms. ● Entrepreneurship: Individuals can open their own Vedic Maths training centers or acquire franchises, a low-investment business with high demand from parents. Demand in Other Industries In other industries, the applications are less about "Vedic Maths" as a subject and more about the core principles it uses: ● Engineering and Computer Science: The algorithms and structured methods found in Vedic Sutras (like the Nikhilam Sutra for multiplication) are used in research to design more efficient, low-power, and high-speed hardware for applications such as digital signal processing (DSP) and cryptography. ● Finance and Business: The enhanced mental agility and quick calculation skills derived from Vedic Maths can be beneficial for professionals in fields requiring rapid data analysis, risk assessment, and quick decision-making in high-speed environments like stock markets or casinos. ● Research and Academics: There is ongoing academic research into the cognitive benefits and modern applications of Vedic methods, contributing to its growing recognition. In essence, while the primary direct job market is educational, the skills and principles of Vedic Mathematics have niche but significant applications in technological and analytical fields.
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		Job Prospects: Vedic Mathematics offers good job prospects primarily in teaching and training, with rising demand in schools, online platforms, and for freelance work in India and globally, leading to roles as Maths Tutors, Trainers, or Subject Matter Experts, with potential earnings increasing with experience, especially with remote and online opportunities expanding rapidly. Career paths range from private tutoring (INR 500-1500+/hr) and online courses (global reach) to institutional roles, with strong growth expected due to parental interest and school adoption.
2	Vertical:	IKS
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To enable the learners to explore the power of VedicMaths. CO 2. To make learners strong in Numerical Maths. CO 3. To enable learners to recognize and understand simple techniques of ArithmeticCalculations. CO 4. To train learners to use the ideas of Vedic Maths in daily calculations and make those calculations with accuracy and speed	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Perform simple arithmetic calculations with speed and accuracy OC 2. Will be able to generate tables of any number OC 3. To perform products of large numbers quickly OC 4. Develop confidence in calculating square roots and cube roots of integers OC 5. Perform difficult calculations speedily. OC 6. Face Numerical Aptitude part of any Competitive Examination confidently.	
9	Modules:- Vedic Mathematics :Theory Module 1 (15 hours): Introduction of Sutras ,sub Sutras & its applications ,Basic Vedic Mathematics Techniques in Multiplication-Special three Cases of Series of 9 and Series of 1,Various techniques to carry out basic operations covering Addition, Subtraction, Multiplication, Division, Complements and Bases. Module 2 (15 hours): General multiplication (Vertically Cross- wise), Multiplications by numbers near base. Different methods of Squares (General method, Base method, Duplex method etc.)Cubes, Cube roots, Square Roots, Division of numbers near base,General division.,Quadratic Equations, Simultaneous Equations.	
10	Text Books 1. Bhatiya Dhaval, Vedic Mathematics Made Easy, Jaico PublishingHouse 2. Thakur Rajesh Kumar, Vedic Mathematics for students taking Competitive Examinations. Unicorn Books 2015 or LaterEdition	
11	Reference Books 1. https://vedicmathbyomkartendolkar.blogspot.com/ 2. Gupta Atul, Power of Vedic Mathematics with Trigonometry,JaicoBooks	

	3. V. G. Unkalkar, Magical World of Mathematics(Vedic Mathematics), Vandana Publishers,Bangalore			
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%		
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.		
	Total: 20 marks	Total: 30 Marks		
14	Format of Question Paper:			
	Total Marks: 30		Duration: 1 Hour	
	Question	Based On	Options	Marks
	Q.1	Module 1	Any 2 out of 4	10
	Q.2	Module 2	Any 2 out of 4	10
	Q.3	Module 1 & 2	Any 2 out of 4	10

Co-curricular Courses

Name of the Course: NATIONAL SERVICE SCHEME-I (NSS-I)

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: National Service Scheme (NSS) is a community-oriented programme designed to develop social responsibility, civic awareness, leadership qualities and a spirit of voluntary service among students. The course introduces students to the history, objectives, structure and functioning of NSS and provides an understanding of Indian society, social justice, inclusive growth, constitutional values, national integration and communal harmony. Through regular activities and field projects, students get opportunities to interact with communities and apply their knowledge to real-life social situations. Relevance: The course is relevant for developing socially responsible and responsible citizens who understand community needs and social challenges. It promotes awareness of constitutional values, equality, social justice, national unity and sustainable community development. It also supports the objectives of NEP 2020 by encouraging experiential learning, community engagement, holistic development and responsible citizenship. Usefulness: ● Develops social awareness and civic responsibility. ● Helps students understand Indian society and its diverse social structure. ● Creates awareness about social justice, equality and inclusive growth. ● Develops leadership, teamwork and communication

		skills. ● Provides practical experience through community-oriented activities. ● Encourages students to contribute to social and national development. Application: The knowledge and skills acquired through NSS can be applied in: ● Community development programmes. ● Rural and urban development activities. ● Social awareness campaigns. ● Environmental and cleanliness initiatives. ● Educational and health awareness programmes. ● Disaster management and relief activities. ● Gender equality and social inclusion programmes. ● National integration and communal harmony initiatives. ● Voluntary and community service activities. Interest: The course creates interest among students by providing opportunities to participate in practical community activities rather than limiting learning to classroom teaching. Field visits, social surveys, awareness campaigns, community projects and interaction with different sections of society help students understand real-world social issues and develop empathy, confidence and leadership. Connection with Other Courses: NSS has interdisciplinary connections with: ● Foundation Course: Constitutional values, civic awareness, ethics and social responsibility. ● Environmental Studies: Environmental awareness, conservation and sustainable development. ● Communication Skills: Communication, teamwork and public interaction. ● Psychology: Human personality, behaviour and social interaction. ● Sociology: Society, social structure, caste, family and social change. ● Political Science: Indian Constitution, citizenship and national integration. ● Economics: Inclusive growth, regional imbalance and socio-economic development. ● Management: Leadership, teamwork, planning and project management. ● Health and Physical Education: Community health and personal development. Demand in the Industry: Although NSS is primarily a social-service and community-development course, the competencies developed through NSS are valued across sectors. Employers increasingly seek graduates with communication skills, teamwork, leadership, problem-solving ability, social awareness, adaptability and project-management skills. NSS activities provide students with practical exposure to these transferable competencies.
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		Job Prospects: The course develops competencies useful in: • NGOs and voluntary organizations. • Community development organizations. • Social welfare organizations. • Government and local self-government programmes. • CSR and community outreach departments. • Educational and awareness organizations. • Rural development projects. • Disaster management and relief organizations. • Public health and social awareness projects. • Social entrepreneurship and development-sector initiatives.
2	Vertical:	CC
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks (30+20)
7	Course Objectives(CO): CO1. Understand the history, objectives, structure, organization and functioning of the National Service Scheme. CO2. Develop an understanding of Indian society, the Indian Constitution, social justice, inclusive growth and major social issues. CO3. Develop awareness of human personality, national integration, communal harmony and the values of responsible citizenship. CO4. Apply knowledge and skills through active participation in NSS regular activities, community programmes and field projects.	
8	Course Outcomes (OC): After successful completion of this course, students will be able to: OC1. Explain the history, objectives, structure and functioning of NSS and demonstrate awareness of the role of NSS volunteers. OC2. Describe the major features of Indian society and the Indian Constitution and explain their significance for social integrity and development. OC3. Analyze basic social issues, social justice, inclusive growth, human personality, national integration and communal harmony. OC4. Participate effectively in community-oriented activities and field projects by demonstrating social responsibility, teamwork, leadership and civic engagement.	
9	Modules:- Module 1 (15 hours): Introduction to NSS: Orientation and structure of NSS; History of NSS; Objectives of NSS; NSS Symbol and its meaning; NSS hierarchy from national to college level Regular Activities: Distribution of working hours; Association between issues and programmes; Community projects; Urban and rural activities; Association/participation; Modes of activity evaluation Concept of Society and Development of Indian Society: Concept of society; Development of Indian society; Features of Indian society; Division of labour; Caste system in India Features of Indian Constitution: Salient features of the Indian Constitution; Provisions related to social integrity; Constitutional provisions related to social development Module 2 (15 hours): Social Justice and Inclusive Growth: Concept of social justice; Features of	

	social justice; Concept of inclusive growth; Features and importance of inclusive growth Basic Social Issues in India: Degeneration of value system; Changing family system; Gender issues; Regional imbalance Dimensions of Human Personality: Physical, intellectual, emotional, social, moral and spiritual dimensions of personality; Importance of balanced personality development National Integration and Communal Harmony: Meaning and importance of national integration; Factors promoting national unity; Communal harmony; Role of NSS volunteers in promoting unity and harmony		
10	Text Books 1. National Service Scheme Manual, Ministry of Youth Affairs & Sports, Government of India. 2. National Service Scheme: A Guide for Volunteers, Ministry of Youth Affairs & Sports, Government of India. 3. NSS Programme Officer's Manual, Ministry of Youth Affairs & Sports, Government of India. 4. Indian Society, NCERT, Government of India. 5. Indian Constitution at Work, NCERT, Government of India.		
11	Reference Books 1. Indian Society: Themes and Social Change, NCERT. 2. Social Problems in India, Ram Ahuja, Rawat Publications. 3. Indian Society and Social Change, various UGC/University-recommended texts. 4. Introduction to Sociology, Anthony Giddens, W. W. Norton & Company.		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		
	Duration: 2 Hours		
	Question	Based On	Options
	Marks		
Q.1	Module 1	Any 2 out of 4	10
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1&2	Any 2 out of 4	10

Sem – II

Mandatory Courses

Name of the Course: Design and Analysis of Algorithms

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Design and Analysis of Algorithms course is a fundamental exploration into the systematic study of algorithms, their design principles, and the analysis of their efficiency. It forms the backbone of computer science education, providing essential skills for solving complex computational problems. Relevance: In the ever-evolving landscape of computer science, the Design and Analysis of Algorithms course is highly relevant. It equips students with the intellectual tools necessary to address challenges in diverse areas, from software development to artificial intelligence. Usefulness: This course is instrumental in cultivating algorithmic thinking. Participants learn to devise efficient algorithms, analyze their correctness, and evaluate their performance, essential skills for creating optimized solutions in various computing applications. Application: The knowledge gained from this course finds application in a myriad of scenarios, from developing efficient search and sorting algorithms to optimizing resource utilization in network design and artificial intelligence. Interest: The course often captivates students due to its intellectual challenges and problem-solving nature. Participants engage in dissecting complex problems, devising algorithmic solutions, and analyzing their efficiency, fostering a deep appreciation for algorithmic thinking. Connection with Other Courses: The Design and Analysis of Algorithms course establishes vital connections with other computer science disciplines. It forms the basis for advanced courses in data structures, algorithmic complexity, and computational theory, providing a holistic understanding of computation. Demand in the Industry: Professionals well-versed in algorithm design and analysis are in high demand. Industries ranging from technology and finance to healthcare actively seek individuals who can develop efficient algorithms to solve complex problems and enhance system performance. Job Prospects: Graduates from a Design and Analysis of Algorithms course find themselves well-positioned for various roles, including software engineer, algorithm developer, data scientist, and research scientist. These professionals are valued for their ability to devise elegant and efficient solutions to computational challenges.

2	Vertical:	Major
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To make students understand the basic principles of algorithm design CO 2. To give idea to students about the theoretical background of the basic data structures CO 3. To familiarize the students with fundamental problem-solving strategies like searching, sorting, selection, and recursion and help them to evaluate efficiencies of various algorithms. CO 4. To teach students the important algorithm design paradigms and how they can be used to solve various real world problems	
8	Course Outcomes (OC): OC 1. Students should be able to understand and evaluate efficiency of the programs that they write based on performance of the algorithms used. OC 2. Students should be able to appreciate the use of various data structures as per need OC 3. To select, decide and apply appropriate design principle by understanding the requirements of any real life problems.	
9	Modules:- Module 1 (15 hours): Introduction to algorithms - What is algorithm, analysis of algorithm, Types of complexity, Running time analysis, How to Compare Algorithms, Rate of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega- Ω Notation, Theta- Θ Notation, Asymptotic Analysis, Performance characteristics of algorithms, Estimating running time / number of steps of executions on paper, Idea of Computability Introduction to Data Structures - What is data structure, types, Introduction to Array(1-d & 2-d), Stack and List data structures, operations on these data structures, advantages disadvantages and applications of these data structures like solving linear equations, Polynomial Representation, Infix-to-Postfix conversion. Recursion - What is recursion, Recursion vs Iteration, recursion applications like Factorial of a number, Fibonacci series & their comparative analysis with respect to iterative version, Tower of Hanoi problem. Basic Sorting Techniques - Bubble, Selection and Insertion Sort & their comparative analysis	
	Module 2 (15 hours): Searching Techniques - Linear Search and its types, Binary Search and their comparative analysis, Selection Techniques - Selection by Sorting, Partition-based Selection Algorithm, Finding the Kth Smallest Elements in Sorted Order & their comparative analysis, String Algorithms - Pattern matching in strings, Brute Force Method & their comparative analysis Algorithm Design Techniques - Introduction to various types of classifications/design criteria and design techniques, Greedy Technique - Concept, Advantages & Disadvantages, Applications,	

	Implementation using problems like - file merging problem. Divide-n-Conquer - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - merge sort, Strassen's Matrix Multiplication Dynamic Programming - Concept, Advantages & Disadvantages, Applications, Implementation using problems like - Fibonacci series, Factorial of a number, Longest Common subsequence Backtracking Programming- Concept, Advantages & Disadvantages, Applications, Implementation using problems like N-Queen Problem																		
10	Text Books 1. Data Structure and Algorithm Using Python, Rance D. Necaise, Wiley India Edition, 2016. 2. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications, 2016. 3. Introduction to Algorithms, Thomas H. Cormen, 3rd Edition, PHI.																		
11	Reference Books 1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, Pearson, 3rd Edition, 2011. 2. Design and Analysis of Algorithms, S. Sridhar, Oxford University Press, 2014.																		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%																	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.																	
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14	Format of Question Paper: Total Marks: 30 Duration: 1 Hour <table><tr><th>Question</th><th>Based On</th><th>Options</th><th>Marks</th></tr><tr><td>Q.1</td><td>Module 1</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.2</td><td>Module 2</td><td>Any 2 out of 4</td><td>10</td></tr><tr><td>Q.3</td><td>Module 1 & 2</td><td>Any 2 out of 4</td><td>10</td></tr></table>			Question	Based On	Options	Marks	Q.1	Module 1	Any 2 out of 4	10	Q.2	Module 2	Any 2 out of 4	10	Q.3	Module 1 & 2	Any 2 out of 4	10
Question	Based On	Options	Marks																
Q.1	Module 1	Any 2 out of 4	10																
Q.2	Module 2	Any 2 out of 4	10																
Q.3	Module 1 & 2	Any 2 out of 4	10																

Name of the Course: Introduction to OOP using C++

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Introduction to Object-Oriented Programming (OOP) using C++ course is a foundational exploration into the principles of object-oriented programming, using the C++ programming language. This course serves as a gateway for students to understand and apply key concepts in software design and development. Relevance: In the contemporary software development landscape, understanding OOP principles is crucial. The C++ language, with its strong support for object-oriented features, is widely used in building robust and efficient software systems. This course is, therefore, highly relevant

		to the needs of modern programming. Usefulness: The course is instrumental in imparting essential programming paradigms such as encapsulation, inheritance, and polymorphism. Participants gain valuable skills in designing modular and reusable code, contributing to the creation of scalable and maintainable software solutions. Application: The concepts learned in this course find direct application in software development. Participants learn to structure code using classes and objects, facilitating the creation of efficient and well-organized programs. Interest: The course often captivates students due to its practical and creative aspects. Through hands-on projects, participants engage in designing and implementing solutions using OOP principles, fostering a deep interest in software design and development. Connection with Other Courses: This course establishes strong connections with other programming and software engineering courses. It lays the groundwork for advanced studies in software architecture, design patterns, and application development, providing a seamless transition to more complex programming concepts. Demand in the Industry: Professionals with a solid understanding of OOP using C++ are in high demand. Industries ranging from software development to embedded systems actively seek individuals who can leverage OOP principles to create efficient, modular, and maintainable code. Job Prospects: Students completing this course may find diverse job prospects. Roles may include software developer, systems analyst, application architect, and embedded systems engineer. These professionals are valued for their ability to contribute to the creation of robust and scalable software solutions.
2	Vertical:	Major
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To make learner understand the concepts of OOP CO 2. To make learner understand the design of OOP through UML CO 3. To make learner familiar with the syntax of C++ CO 4. To make learner Analyze and implement concepts of OOP CO 5. To make learner create programs relating to OOP concepts	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. The learner will be able to understand, remember, demonstrate, explain and describe concept of OOP OC 2. The learner will be able to design UML based diagrams OC 3. The learner will be able to illustrate the different types of control statements in	

	C++ OC 4. The learner will be able to analyze and implement concept of OOP OC 5. The learner will be able to write and create programs relating to OOP concepts
9	Modules:- Module 1 (15 hours): Introduction to Programming Concepts: Object oriented programming paradigm, basic concepts of object oriented programming, benefits of object oriented programming, object oriented languages, applications of object oriented programming. Tokens-keywords, identifiers, constants-integer, real, character and string constants, backslash constants, features of C++ and its basic structure, simple C++ program without class, compiling and running C++ program Data Types, Data Input Output and Operators: Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators. Decision Making, Loops, Arrays and Strings: Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and string and string manipulations Unified Modeling Language (UML): Introduction to UML & class diagrams. Classes, Abstraction & Encapsulation: Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function. Constructors and Destructors: Default constructor, parameterized constructor, copy constructor, private constructor, destructors. Working with objects: Accessor - mutator methods, static data and static function, access specifiers, array of objects. Module 2 (30 hours): Polymorphism - Binding-static binding & overloading, constructor overloading function overloading, operator overloading, overloading unary and binary operators Modelling Relationships in Class Diagrams: Association, Aggregation-Composition and examples covering these principles Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes. Modelling Relationships: Generalization-Specialization and examples covering these principles Run time Polymorphism - Dynamic Binding, Function overriding, virtual function, pure virtual function, virtual base class, abstract class. Pointers: Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer, pointers to derived classes File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling. Applying OOP to solve real life applications: To cover case studies like library management, order management etc. to design classes covering all relationships

10	Text Books 1. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India. 2. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition2015		
11	Reference Books 1. Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017 2. Let Us C++ by KanetkarYashwant, Publisher: BPB Publications, 2020 3. Object Oriented Analysis and Design by Timothy Budd TMH, 2001		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		Duration: 1 Hour
	Question	Based On	Options
	Marks		
	Q.1	Module 1	Any 2 out of 4
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Name of the Course: Computer Science Practical 2

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Computer Science Practical Course covering Design and Analysis of Algorithms and Object-Oriented Programming (OOP) using C++ is a comprehensive exploration into fundamental computer science concepts and practical programming skills. It integrates the study of algorithmic design with hands-on application using the C++ programming language. Relevance: In the dynamic field of computer science, the integration of algorithmic design and object-oriented programming is highly relevant. This course equips students with essential skills to solve complex problems, design efficient algorithms, and implement practical solutions using the OOP paradigm in C++. Usefulness: The course is invaluable for developing a strong foundation in algorithmic thinking and software design. Students learn to analyze algorithm efficiency, apply OOP principles for code modularity, and create robust software solutions, enhancing their overall programming proficiency. Application: The concepts acquired in this practical course find direct application in real-world scenarios. Students engage in hands-on projects where

		they design and implement algorithms, analyze their performance, and develop software applications using object-oriented principles in C++. Interest: The practical nature of the course often captivates students. Through project-based learning, participants apply algorithmic strategies, design class hierarchies, and implement solutions in C++, fostering a deep interest in problem-solving and software development. Connection with Other Courses: This practical course establishes a strong connection with other computer science courses. It lays the groundwork for advanced studies in algorithmic complexity, data structures, software engineering, and advanced topics in object-oriented programming, providing a well-rounded education. Demand in the Industry: Professionals with proficiency in algorithmic design and object-oriented programming in C++ are in high demand. Industries spanning software development, technology, and finance actively seek individuals who can apply these skills to create efficient and scalable software solutions. Job Prospects: Graduates from this practical course have diverse job prospects. Roles may include software engineer, algorithm developer, systems analyst, or application developer. These professionals are valued for their ability to contribute to algorithmically optimized, modular, and maintainable software.
2	Vertical:	Major
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. Analyze and implement algorithms for common computational problems. CO 2. Implement algorithms using divide and conquer strategies. CO 3. Apply dynamic programming techniques to solve optimization problems. CO 4. Implement and analyze algorithms based on greedy strategies. CO 5. Comprehend the principles of object-oriented programming. CO 6. Design and implement classes and objects in C++. CO 7. Implement single, multiple, and hierarchical inheritance. CO 8. Implement operator overloading for user-defined types. CO 9. Understand the impact of access specifiers on class members.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Design and implement algorithms for various problem domains. OC 2. Evaluate and compare the time and space complexities of algorithms. OC 3. Apply divide and conquer strategies to solve computational problems. OC 4. Utilize dynamic programming techniques for optimization problems. OC 5. Implement and analyze algorithms based on greedy strategies.	

	OC 6. Design and implement classes and objects in C++. OC 7. Apply inheritance and polymorphism concepts in program development. OC 8. Implement operator overloading for enhanced class functionality. OC 9. Utilize advanced features like friend functions, inline functions, and this pointer. OC 10. Understand the impact of scope specifiers on class members.
9	Modules:- Module 1 (30 hours): Design & Analysis of Algorithms – Practical Array Operations: Implement programs for 1-d arrays, Implement programs for 2-d arrays. List-Based Stack Operations: Create a list-based stack and perform stack operations. Linear and Binary Search: Implement linear and binary search algorithms on a list. Sorting Algorithms: Implement sorting algorithms (e.g., bubble, selection, insertion). Nth Max/Min Element: Implement algorithms to find Nth Max/Min element in a list. String Pattern Matching: Implement algorithms to find a pattern in a given string. Recursion: Implement recursive algorithms (e.g., factorial, Fibonacci, Tower of Hanoi). Greedy Algorithm: Solve problems like file merging and coin change using the Greedy Algorithm. Divide and Conquer: Implement algorithms like merge sort and Strassen's Matrix Multiplication. Dynamic Programming: Implement algorithms for Fibonacci series and Longest Common Subsequence using dynamic programming.
	Module 2 (30 hours): OOPs using C++ – Practical Introduction to Classes: Create a simple class with data members and member functions. Demonstrate the use of class instances to access data and invoke member functions. Branching and Looping with Classes: Implement programs utilizing branching and looping statements within class methods. Arrays and Classes:

	Develop a program that employs one and two-dimensional arrays within a class. Illustrate how classes can handle array-based data structures. Scope Resolution Operator: Use the scope resolution operator to declare variables at different scope levels. Display and compare the values of variables with different scopes. Constructors and Destructors: Implement programs showcasing various types of constructors and destructors. Explore default, parameterized, copy constructors, and destructor functionalities. Access Specifiers: Demonstrate the use of public, protected, and private scope specifiers within a class. Understand the impact of different access specifiers on class members. Inheritance: Implement classes to demonstrate single and multilevel inheritance scenarios. Showcase how derived classes inherit properties from the base class. Develop programs illustrating multiple and hierarchical inheritance. Create programs that demonstrate the interaction between inheritance and derived class constructors. Understand the order of constructor invocation in the inheritance hierarchy. Advanced Concepts: Implement programs showcasing friend functions, inline functions, and the use of this pointer within classes. Function Overloading and Overriding: Develop programs to demonstrate function overloading and overriding within classes. Pointers and File Handling: Explore the use of pointers within classes, emphasizing dynamic memory allocation. Develop programs for both text and binary file handling within a class context.
10	Text Books 1. Data Structure and Algorithm Using Python, Rance D. Necaise, Wiley India Edition, 2016. 2. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.
11	Reference Books 1. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications, 2016. 2. Let Us C++ by KanetkarYashwant, Publisher: BPB Publications, 2020
12	Internal Continuous Assessment: 40% Semester End Examination: 60%

13	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks .	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
	Total: 20 marks	Total: 30 Marks												
14	Format of Question Paper: Total Marks: 30 Duration: 2 Hours <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Question</th><th>Practical Question Based On</th><th>Marks</th></tr> </thead> <tbody> <tr> <td>Q.1</td><td>Module 1</td><td>12</td></tr> <tr> <td>Q.2</td><td>Module 2</td><td>12</td></tr> <tr> <td>Q.3</td><td>Viva</td><td>06</td></tr> </tbody> </table>		Question	Practical Question Based On	Marks	Q.1	Module 1	12	Q.2	Module 2	12	Q.3	Viva	06
Question	Practical Question Based On	Marks												
Q.1	Module 1	12												
Q.2	Module 2	12												
Q.3	Viva	06												

Minor

Name of the Course: Descriptive Statistics

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: Descriptive statistics is a branch of statistics that involves summarizing, organizing, and describing the main features of a dataset in a clear and meaningful way. Its purpose is to present raw data in a format that is easy to understand and interpret, often serving as the initial step in any data analysis. Relevance: Descriptive statistics are highly relevant as the foundational step in data analysis, summarizing complex datasets into understandable insights (mean, median, mode, spread) to reveal patterns, trends, and characteristics, crucial for informed decision-making in business (sales), healthcare (patient data), education (performance), and research across all fields, serving as the base for advanced inferential analysis. Core Relevance & Purpose ● Data Summarization: Condenses large, raw data into manageable summaries (e.g., average scores, total sales). ● Pattern & Trend Identification: Helps spot trends, outliers, and distributions (e.g., how spread out test scores are). ● Foundation for Deeper Analysis: Sets the stage for inferential statistics, by exploring data first. ● Simplified Communication: Makes data visually understandable through charts (histograms, bar charts) for easier interpretation. Usefulness: Descriptive statistics is highly useful as it provides the foundational methods for summarizing, organizing, and presenting raw data in a meaningful and understandable way. It is an essential first step in

		most data analysis and research across numerous fields. Key Areas of Usefulness • Data Summarization and Organization: The primary function is to condense large, raw datasets into manageable summaries. This allows researchers and decision-makers to quickly grasp the main features of the data without having to examine every single data point individually. • Identification of Patterns and Outliers: By summarizing data through measures of central tendency (mean, median, mode) and dispersion (range, variance, standard deviation), patterns, trends, and unusual data points (outliers) become easier to spot. • Enhanced Decision-Making: Descriptive statistics provide the empirical evidence necessary for informed decision-making across various industries, including business, healthcare, and finance. Instead of relying on intuition, organizations can make evidence-based choices. • Foundation for Further Analysis: It serves as a critical prerequisite and building block for more advanced analytical methods, especially inferential statistics, which use sample data to make predictions or draw conclusions about a larger population. • Effective Communication: Visual tools such as graphs, charts (bar charts, histograms, pie charts, scatter plots), and tables are used to communicate findings clearly and effectively to a wide audience, including non-technical stakeholders. Application: The principles of descriptive statistics are applied in countless real-world scenarios: • Business & Finance: Used to analyze sales data, market trends, customer behavior, and stock market volatility to optimize strategies and manage risk. • Education: Teachers and administrators use descriptive statistics to summarize student test scores, evaluate teaching methods, and monitor student growth over time. • Healthcare: Professionals analyze patient data, track illness prevalence, assess treatment efficacy, and identify risk factors to refine care protocols. • Government: Agencies employ it to analyze census data, population demographics, and economic indicators for policy making and resource allocation. In essence, descriptive statistics transforms uninterpretable raw data into valuable insights, enabling understanding and guiding action in almost every data-driven field. Interest: The key interests and aspects of the subject include: • Data Summarization: Condensing large amounts of raw data into understandable and manageable chunks of information. • Identification of Key Properties: Describing the fundamental attributes of a dataset to gain immediate insights into its nature. • Data Visualization: Presenting data clearly using various charts and graphs (histograms, bar charts, pie charts, scatterplots, and box plots) to facilitate interpretation and communication.
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		Connection with Other Courses: Descriptive statistics serves as a foundational element and is inherently connected to a wide array of other courses and fields through its core function of summarizing and describing data. Core Statistical Connections • Inferential Statistics: Descriptive statistics provides the initial summaries of data that inferential statistics then uses to make predictions and draw conclusions about larger populations. • Probability Theory: The principles of probability are fundamental to understanding statistical methods and distributions, which are essential for both descriptive and inferential statistics. • Data Visualization: Subjects like data visualization (using tools such as Matplotlib, R, or Excel) rely on descriptive statistics to effectively present data in charts, graphs, and tables. • Statistical Modeling and Regression Analysis: These advanced courses use descriptive measures (like correlation) to understand relationships between variables before building predictive models. Connections to Other Academic Disciplines Descriptive statistics is a key quantitative method used across numerous disciplines: • Data Science and Machine Learning: It is the first step in the data science pipeline (exploratory data analysis - EDA), helping data scientists understand patterns and spot outliers before building machine learning or AI models. • Mathematics: Statistics is considered a branch of applied mathematics, utilizing concepts from algebra, calculus, and linear algebra for its formulas and operations. • Business and Finance: Used for sales analysis, market research, understanding customer behavior, and analyzing stock market trends and risks. • Natural and Social Sciences: Fields like biology, psychology, economics, and public health use descriptive statistics to analyze experimental or survey data, track patient data, and evaluate student performance. • Computer Science and Programming: Courses in Python, R, SQL, and data mining teach how to apply descriptive statistics using software libraries and database systems. Demand in the Industry: Descriptive statistics provides the essential tools to transform raw data into understandable and actionable insights. Its core purpose is to summarize and present data in a meaningful way, allowing professionals to: • Identify patterns and trends in data, which informs business strategies and operational improvements. • Evaluate performance and track key performance indicators (KPIs). • Facilitate data-driven decision-making by providing evidence rather than relying solely on intuition. • Communicate complex information clearly to a wide range of stakeholders using visualizations like charts and graphs. • Lay the groundwork for more advanced statistical analyses.
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		such as predictive and prescriptive analytics. Industries with High Demand Professionals skilled in descriptive statistics are in demand across diverse industries: • Business and Finance: Used for analyzing financial performance, assessing risk and volatility, and identifying sales trends. • Healthcare and Medicine: Applied to summarize patient data, analyze treatment outcomes, and manage resource allocation. • Retail and E-commerce: Helps in understanding customer purchasing patterns, optimizing inventory, and assessing marketing campaign effectiveness. • Marketing and Market Research: Essential for analyzing consumer behavior, product demand, and market trends to tailor strategies. • Manufacturing: Utilized for monitoring quality control processes, identifying production inefficiencies, and improving product quality. • Education and Social Sciences: Used to evaluate student performance, analyze survey results, and study demographic trends. Job Prospects: Proficiency in descriptive statistics is a core competency for several in-demand job roles: • Data Analyst: Collects, analyzes, and summarizes data to help companies make business decisions. • Market Research Analyst: Researches market conditions and consumer behavior using statistical methods to inform marketing strategies. • Statistician: Designs data collection methods and analyzes data to draw reliable conclusions. • Quality Control Analyst: Monitors manufacturing processes using statistical measures to ensure product standards are met. • Sports Analyst: Uses statistics to evaluate athlete performance and inform coaching and game strategies.
2	Vertical:	MINOR
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To develop the learners ability to deal with different types of data. CO 2. To enable the use of different measures of central tendency and dispersion wherever relevant. CO 3. To make learners aware about the techniques to check the Skewness and Kurtosis of data. CO 4. To make learners able to find the correlation between different variables and further apply the regression analysis to find the exact relation between them CO 5. To develop the ability to analyse statistical data through R software.	

8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Organise, manage and present data. OC 2. Analyse Statistical data using measures of central tendency and dispersion. OC 3. Analyse Statistical data using basic techniques of R. OC 4. Study the relationship between variables using techniques of correlation and regression.	
9	Modules:-Descriptive Statistics -Theory -Minor Module 1 (15 hours):	
	Measures of Central tendency: Concept of average/central tendency, characteristics of a good measure of central tendency. Arithmetic Mean (A.M.), Median, Mode - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined arithmetic mean. Partition Values: Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data, Measures of Skewness and Kurtosis: Concept of Skewness and Kurtosis,	
	Module 2 (15 hours):	
	Measures dispersion: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.) Moments: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments. .	
10	Text Books 1. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta. 2. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi	
11	Reference Books 1. Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi. 2. . Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi. 3. Purohit, S. G., Gore S. D., Deshmukh S. R. (2008). Statistics Using R, Narosa Publishing House, New Delhi. 4. Schaum's Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum's Outline Series Mcgraw-Hill	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.
	Total: 20 marks	Total: 30 Marks

14	Format of Question Paper:			
	Total Marks: 30		Duration: 1 Hour	
	Question	Based On	Options	Marks
	Q.1	Module 1	Any 2 out of 4	10
	Q.2	Module 2	Any 2 out of 4	10
	Q.3	Module 1 & 2	Any 2 out of 4	10

Open Electives (OE)

Name of the Course: E-Commerce & Digital Marketing

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: This course introduces students to the fundamentals of E-Commerce and Digital Marketing, covering electronic business models, online payment systems, and strategies for marketing in the digital era. Students learn how businesses leverage digital technologies to enhance consumer experience, improve operational efficiency, and drive sales. The course also explores social media, email, mobile, content marketing, SEO/SEM, and web analytics. Relevance: With the rapid growth of the digital economy, understanding E-Commerce and Digital Marketing is essential for professionals in business, marketing, IT, and entrepreneurship. The course equips students with knowledge and skills to compete in the online marketplace effectively. Usefulness: Students will: ● Understand various E-Commerce and m-Commerce models and applications ● Gain practical skills in digital marketing strategies and tools ● Learn social media engagement, content creation, and analytics ● Understand online payment systems and legal/ethical considerations ● Develop data-driven marketing insights using web and Google Analytics Application: ● E-Commerce platforms (B2B, B2C, C2B, C2C, B2E) ● Online shopping and e-learning portals ● Social media marketing campaigns (Facebook, LinkedIn, Twitter, YouTube) ● Email marketing automation and analytics ● Mobile marketing campaigns and mobile advertising ● Search engine optimization (SEO) and search engine marketing (SEM) ● Web analytics and performance reporting Interest: Students will engage in hands-on projects, such as designing digital marketing campaigns, creating content strategies, and performing

		web analytics. This practical exposure enhances interest and creativity in digital business solutions Connection with Other Courses: Marketing Management Business Analytics Web Development Social Media & Communication Data Science & Analytics Demand in the Industry: The digital economy continues to grow rapidly, creating a high demand for skilled professionals in: • E-Commerce Management • Digital Marketing • Social Media Marketing • SEO/SEM Specialists • Web Analytics Professionals Job Prospects: • Digital Marketing Executive • Social Media Manager • SEO/SEM Analyst • Content Marketing Strategist • E-Commerce Manager • Web Analytics Specialist • Email Marketing Specialist
2	Vertical:	OE
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO1. To understand the fundamentals of E-Commerce and its impact on business models. CO2. To explore electronic payment systems and their applications. CO3. To introduce digital marketing concepts, strategies, and frameworks. CO4. To develop skills in social media, email, mobile, and content marketing. CO5. To learn SEO, SEM, and online advertising techniques. CO6. To analyze web traffic and marketing performance using analytics tools.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC1. Explain the concepts of E-Commerce, m-Commerce, and digital business models. OC2. Analyze the impact of E-Commerce on traditional and digital business models. OC3. Apply electronic payment systems in online business transactions. OC4. Design and implement digital marketing strategies using social media, email, mobile, and content marketing. OC5. Optimize websites using SEO techniques and manage paid campaigns using SEM tools. OC6. Create advertising campaigns and analyze marketing performance. OC7. Use web analytics tools to measure, report, and improve online business outcomes. OC8. Understand legal and ethical issues in E-Commerce and digital marketing. OC9. Develop a digital marketing plan for real-world applications.	

9	Modules:- Module 1 (15 hours): Introduction to E-Commerce and E- Business: Definition and competing in the digital economy, Impact of E-Commerce on Business Models, Factors Driving e-commerce and e-Business Models, Economics and social impact of e-Business, opportunities and Challenges, e-Commerce vs m- Commerce, Different e-Commerce Models (B2B, B2C, C2B, C2C, B2E), e-Commerce Applications: e-Trading, e-Learning, e-Shopping, Virtual Reality & Consumer Experience, Legal and Ethical issues in e-Commerce. Overview of Electronic Payment systems: Types of Electronic payment schemes (Credit cards, Debit cards, Smartcards, Internet banking), E- checks, E-Cash Concepts and applications of EDI and Limitation Introduction & origin of Digital Marketing: Traditional v/s Digital Marketing. Digital Marketing Strategy, The P-O-E-M Framework, Segmenting & Customizing Messages, The Digital landscape, Digital Advertising Market in India. Skills required in Digital Marketing. Digital Marketing Plan. Social Media Marketing: Meaning, Purpose, types of social media websites, Social Media Engagement, Target audience, Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools, LinkedIn Marketing: Importance of LinkedIn Marketing, Framing LinkedIn Strategy, Lead Generation through LinkedIn, Content Strategy, Analytics and Targeting, Twitter Marketing: Framing content strategy, Twitter Advertising Campaigns, YouTube Marketing: Video optimization, Promoting on YouTube, Monetization, YouTube Analytics Module 2 (15 hours): Email Marketing: Types of Emails, Mailing List, Email Marketing tools, Email Deliverability & Email Marketing automation Mobile Marketing: Introduction, Mobile Usage, Mobile Advertising, Mobile Marketing Types, Mobile Marketing Features, Mobile Campaign Development, Mobile Advertising Analytics Content Marketing: Introduction, Content marketing statistics, Types of Content, Types of Blog posts, Content Creation, Content optimization, Content Management & Distribution, Content Marketing Strategy, Content creation tools and apps, Challenges of Content Marketing Search Engine Optimization: Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimise website, On-page and off-page optimization Search Engine Marketing: Introduction to SEM, Introduction to Ad Words - Google Ad Words, Ad Words fundamentals, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation, Display marketing, Buying Models: Cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA). Web Analytics: Purpose, History, Goals & objectives, Web Analytic tools & Methods. Web Analytics Mistakes and Pitfalls. Google Analytics: Basics of Google Analytics, Installing Google Analytics in website, Parameters of Google Analytics, Reporting and Analysis
10	Text Books 1. Dave Chaffey, <i>Digital Marketing: Strategy, Implementation & Practice</i>, Pearson.

	Kenneth C. Laudon & Carol Guercio Traver, <i>E-Commerce 2023: Business, Technology, Society</i> , Pearson.		
	2. Ryan Deiss & Russ Henneberry, <i>Digital Marketing for Dummies</i> , Wiley.		
11	Reference Books 1. Perry Marshall & Mike Rhodes, <i>Ultimate Guide to Google AdWords</i> , Entrepreneur Press. 2. Ian Dodson, <i>The Art of Digital Marketing</i> , Wiley. 3. Philip Kotler, <i>Marketing Management</i> , Pearson. 4. Simon Kingsnorth, <i>Digital Marketing Strategy</i> , Kogan Page. 5. Dave Chaffey & Fiona Ellis-Chadwick, <i>Digital Marketing</i> , Pearson.		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		Duration: 1 Hour
	Question	Based On	Options
	Marks		
	Q.1	Module 1	Any 2 out of 4
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Name of the Course: Data Hiding & Spreadsheet

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The syllabus on Introduction to Data, Data Handling, and Spreadsheets provides a comprehensive foundation for understanding how raw facts are transformed into meaningful information and used for effective decision making. It covers essential concepts such as data and information, different types of data, methods of data collection, manual and computerized data handling, and the use of spreadsheet software. By integrating theoretical understanding with practical tools like MS Excel, LibreOffice Calc, and Google Sheets, the syllabus prepares students to work confidently with data in academic, professional, and real-life situations. Relevance: This syllabus is highly relevant in today's digital and information-driven world where data plays a critical role in every sector. From education and business to banking and research, accurate data handling is essential for planning, analysis, and decision making. Understanding spreadsheet concepts and data processing techniques aligns well with modern technological practices and the skill-based learning approach promoted by current education policies, making the syllabus timely and meaningful. Usefulness: The usefulness of this syllabus lies in its practical orientation and wide applicability. It helps students develop analytical thinking,

		accuracy, and problem-solving skills by teaching them how to collect, organize, process, and interpret data. The knowledge of spreadsheets enables learners to perform calculations, analyze trends, and present data effectively, which is useful for academic projects, office work, and personal data management such as budgeting and record keeping. Application: The concepts covered in this syllabus have extensive real-world applications. In education, spreadsheets are used to manage student records, attendance, and result analysis. In business and accounting, they support financial calculations, budgeting, inventory management, and reporting. In banking, spreadsheets help in transaction analysis and financial planning, while in research and statistics they are used for data analysis, graphical representation, and interpretation of results. These applications highlight the practical importance of data handling and spreadsheet skills. Interest: The subject generates interest among students because it is closely connected to real-life situations and involves hands-on use of software tools. Working with actual data, performing calculations, and creating charts and reports make learning interactive and engaging. The immediate applicability of the concepts in daily life and academics increases student motivation and confidence in using technology effectively. Connection with Other Courses: This syllabus has strong connections with several other courses such as Computer Science, Information Technology, Commerce, Management, Economics, Mathematics, and Statistics. It supports advanced topics like database management systems, programming, business analytics, accounting, and research methodology. By serving as a foundation course, it helps students better understand and apply concepts in higher-level subjects related to data analysis and information systems. Demand in the Industry: There is a continuous and growing demand in the industry for professionals who possess data handling and spreadsheet skills. Almost every organization expects employees to have basic proficiency in spreadsheets for daily operations and reporting. With increasing reliance on data-driven decision making and digital transformation, these skills are essential across industries such as IT, finance, education, healthcare, research, and government sectors. Job Prospects: The syllabus opens up various job opportunities for students by equipping them with essential data management skills. It supports entry-level roles such as data entry operator, office assistant, accounts assistant, MIS executive, and administrative staff. It also provides a strong base for analytical roles like junior data analyst and business analyst at the initial level. Additionally, the knowledge gained acts as a stepping stone for advanced careers in data analytics, finance, research, and information systems, thereby enhancing overall employability.
2	Vertical:	OE

3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To introduce students to the basic concepts of data and information. CO 2. To explain the process and importance of data handling. CO 3. To provide theoretical knowledge of spreadsheet concepts and components. CO 4. To develop understanding of applications, advantages, and limitations of spreadsheets.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Explain fundamental concepts of data, information, and data handling. OC 2. Identify and classify different types of data. OC 3. Describe spreadsheet concepts, components, and applications. OC 4. Analyze the advantages and limitations of spreadsheets in data handling.	
9	Modules:- Module 1 (15 hours):	
	Introduction to Data: Definition of data, Definition of information, Difference between data and information, Characteristics of data, Importance of data in everyday life and decision making Types of Data: Numeric data, Text (alphanumeric) data, Date and time data, Logical / Boolean data, Examples of each type Concept of Data Handling: Meaning and definition of data handling, Need and objectives of data handling, Scope of data handling Data Handling Process: Data collection, Data recording, Data organization, Data processing, Data interpretation, Data presentation Data Collection Methods: Primary data collection, Secondary data collection, Advantages and disadvantages of data collection methods Manual and Computerized Data Handling: Manual data handling, Computerized data handling, Comparison between manual and computerized data handling, Advantages of computerized data handling	
	Module 2 (15 hours):	
	Concept of Spreadsheet: Meaning and definition of spreadsheet, Evolution of spreadsheet software, Importance of spreadsheets in data handling Spreadsheet Software: Overview of popular spreadsheet software (MS Excel, LibreOffice Calc, Google Sheets), General features of spreadsheet software Applications of Spreadsheets: Use of spreadsheets in education, Use of spreadsheets in business and accounting, Use of spreadsheets in banking, Use of spreadsheets in research and statistics Spreadsheet Components (Conceptual Understanding) : Workbook and worksheet, Rows, columns, and cells, Cell address and cell range, Active cell	

	Spreadsheet Features (Theory) : Data entry and storage,Calculation capability,Data analysis support,Data presentation and reporting,Advantages of using spreadsheets Limitations of Spreadsheets: Data size limitations,Error possibilities,Security issues,Dependency on user accuracy		
10	Text Books 1. Spreadsheet Fundamentals- Author: Edward Weber (Year: 2018) 2. Data Handling Skills for Business Managers – MS-Excel Authors: Manjiri Shashidhar Rajadhyaksha & Sandeep Kamble (Year: 2025)		
11	Reference Books 1. Introduction to Excel for Business Data - Authors: Julie Romey, Sherie Guess & Gwyn J. Booth (Year: Accessible edition – current digital texts)		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		Duration: 1 Hour
	Question	Based On	Options
	Marks		
	Q.1	Module 1	Any 2 out of 4
	10		
Q.2	Module 2	Any 2 out of 4	
10			
Q.3	Module 1 & 2	Any 2 out of 4	
10			

Vocation Skill Course (VSC)

Name of the Course: Advanced Database Management Systems

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Database Management Systems (DBMS) Using PL/SQL course is a comprehensive exploration into the principles and practices of managing databases using the powerful PL/SQL language. This course provides participants with the skills needed to design, implement, and maintain robust database systems. Relevance: In the era of information technology, databases serve as the backbone of applications. The course is highly relevant as it delves into PL/SQL, a procedural language designed for seamless interaction with Oracle databases, one of the most widely used database management systems. Usefulness: The course is invaluable for individuals seeking proficiency in database management. Participants learn to harness the capabilities of PL/SQL for efficient data storage, retrieval, and manipulation, enhancing the functionality and performance of database systems. Application: The concepts learned in this course find direct application in real-world scenarios. Participants design and implement database structures, write PL/SQL scripts for data manipulation, and optimize database performance, ensuring the efficient operation of data-centric applications. Interest: The hands-on and problem-solving nature of working with databases and PL/SQL often captivates students. Through practical exercises, participants engage in creating and managing databases, fostering a deep interest in efficient data storage and retrieval. Connection with Other Courses: This course establishes strong connections with other courses in the field of database management, data analytics, and software development. It provides a foundation for advanced studies in database optimization, data warehousing, and application development. Demand in the Industry: Professionals proficient in database management using PL/SQL are in high demand. Industries spanning finance, healthcare, and e-commerce actively seek individuals who can design and manage databases to ensure data integrity, security, and optimal performance. Job Prospects: Graduates from a DBMS Using PL/SQL course find diverse job prospects. Roles may include database administrator, SQL developer, data analyst, and database architect. These professionals are valued for their ability to create and manage databases critical to organizational success.

2	Vertical:	SEC
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To develop understanding of concepts and techniques for data management CO 2. To learn about widely used systems for implementation and usage CO 3. To develop understanding of Transaction management and crash recovery.	
8	Course Outcomes (OC): OC 1. Master concepts of stored procedure, functions, cursors and triggers and its use. OC 2. Learn about using PL/SQL for data management. OC 3. Use efficiently Collections and records. OC 4. Understand concepts and implementations of transaction management and crash recovery.	
9	Modules:- Module 1 (30 hours):	
	Introduction to PL/SQL - Write and execute a basic PL/SQL block PL/SQL Fundamentals – Variables and Data Types - Declare variables using different data types - Assign values and use expressions Identifiers, Scope, and Visibility - Demonstrate scope and visibility using nested blocks Control Statements – Conditional Selection - Implement IF, IF–ELSE, ELSIF, and CASE statements Looping and Sequential Control Statements - Use LOOP, WHILE, FOR loops - Demonstrate EXIT, GOTO, and NULL statements Error Reporting Functions - Display runtime errors using SQLCODE and SQLERRM Sequences - Create, reference, alter, and drop sequences Stored Procedure – Simple Procedure - Create and execute a basic stored procedure - Pass IN parameters Stored Procedure for INSERT Operation - Insert records into a table using stored procedure - Use COMMIT inside procedure Stored Procedure for UPDATE Operation - Update table records using stored procedure - Use SQL%ROWCOUNT	

	Stored Procedure for DELETE Operation • Delete records using stored procedure • Handle record-not-found condition Stored Procedure for SELECT Operation • Retrieve data using OUT parameters DML Stored Procedure with Exception Handling • Handle DUP_VAL_ON_INDEX and user-defined errors Module 2 (30 hours): Menu-Driven Stored Procedure for DML Operations • Perform INSERT / UPDATE / DELETE using a single procedure Functions and Recursive Functions • Create and call user-defined functions • Implement recursion Predefined Exceptions • Handle NO_DATA_FOUND, TOO_MANY_ROWS User-Defined and Redefined Exceptions • Raise exceptions explicitly • Demonstrate exception propagation Compile-Time Warnings • Enable and analyze compile-time warnings Implicit and Explicit Cursors • Process query result sets using cursors Cursor Attributes and Invalid Cursor Exception • Use %FOUND, %NOTFOUND, %ROWCOUNT • Handle invalid cursor exception Static SQL and Cursor Variables • Execute static SQL statements • Use REF cursors and CURSOR expressions Transaction Processing and Control • Demonstrate COMMIT, ROLLBACK, SAVEPOINT • Study autonomous transactions and locking Dynamic SQL • Use Native Dynamic SQL (EXECUTE IMMEDIATE) • Use DBMS_SQL package • Demonstrate SQL injection risk Triggers • Create INSERT, UPDATE, DELETE triggers • Implement nested triggers • Enforce data integrity Packages • Create package specification and body • Demonstrate package initialization
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	Nested Tables ● Create nested table types ● Insert and retrieve data from nested tables													
10	Text Books 1. Mastering PL/SQL Through Illustrations: From Learning Fundamentals to Developing Efficient PL/SQL Blocks, Dr. B. Chandra, BPB Publication, 2020 2. Oracle PL/SQL Training Guide., Training guide, BPB Publications, 2016 3. Raghu Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill, 3rd Edition, 2014 4. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th Edition 2019													
11	Reference Books 1. Ivan Bayross, SQL, PL/SQL -The Programming language of Oracle, B.P.B. Publications 2009 2. Ramez Elmasri & Shamkant B. Navathe, Database Management System, Pearson Education, 2008													
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%												
	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module exercise completed within prescribed time holds a value of 10 mark	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
	Total: 20 marks	Total: 30 Marks												
13	Format of Question Paper: Total Marks: 30 Duration: 2 Hours <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Question</th><th style="width: 50%;">Practical Question Based On</th><th style="width: 25%;">Marks</th></tr> </thead> <tbody> <tr> <td>Q.1</td><td>Module 1</td><td>12</td></tr> <tr> <td>Q.2</td><td>Module 2</td><td>12</td></tr> <tr> <td>Q.3</td><td>Viva</td><td>06</td></tr> </tbody> </table>		Question	Practical Question Based On	Marks	Q.1	Module 1	12	Q.2	Module 2	12	Q.3	Viva	06
Question	Practical Question Based On	Marks												
Q.1	Module 1	12												
Q.2	Module 2	12												
Q.3	Viva	06												

Skill Enhancement Course (SEC)

Name of the Course: LINUX Operating System

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: The Linux Operating System course is a foundational exploration into the world of computing, providing students with essential knowledge about this open-source and widely used operating system. Relevance: Linux is integral to various industries, from server administration to software development, cybersecurity, cloud computing, and IoT, making the course highly relevant in today's digital landscape. Usefulness: Linux dominates global server environments, making it a crucial skill for managing and maintaining servers efficiently. Many development tools and environments are Linux-based, enhancing a developer's capabilities. Linux, well-known for its robust security features, plays a pivotal role in the field of cybersecurity, making Linux knowledge invaluable for professionals in this domain. Popular cloud platforms extensively use Linux, making familiarity with it beneficial for cloud administrators. Linux's prevalence in IoT devices and embedded systems underscores its importance for professionals working in these emerging fields. Application: The course introduces students to the core principles and practical applications of Linux, covering areas such as server administration, software development, cybersecurity, cloud computing, and IoT. Interest: With its open-source nature and versatile applications, Linux attracts individuals who appreciate efficient command-line tools and those interested in stability, reliability, and the command-line interface. Connection with Other Courses: The course seamlessly integrates with network administration courses by incorporating essential Linux commands. It also aligns with various software development courses, fostering a comprehensive understanding of computing environments. Demand in the Industry: The industry recognizes the stability, security, and cost-effectiveness of Linux, resulting in a consistently high demand for professionals with Linux expertise. Job Prospects: Graduates of the Linux Operating System course are well-positioned

		for diverse roles, including system administrators, network administrators, DevOps engineers, cloud administrators, cybersecurity analysts, and software developers.
2	Vertical:	SEC
3	Type:	Practical
4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To learn basic concepts of Linux in terms of operating system CO 2. To learn use of various shell commands with regular expressions CO 3. To set Linux Environment variables and learn setting file permissions to maintain Linux security implementation CO 4. To learn various editors available in Linux OS and learn shell scripting. CO 5. To learn installation of compilers and programming using C and Python languages on Linux platform.	
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. Work with Linux file system structure, Linux Environment OC 2. Handle shell commands for scripting, with features of regular expressions, redirections OC 3. Implement file security permissions OC 4. Work with vi, sed and awk editors for shell scripting using various control structures OC 5. Install software like compilers and develop programs in C and Python programming languages on Linux Platform	
9	Module 1 (30 hours): LINUX Operating System – Practical 1. Installation of Ubuntu Linux Install Ubuntu Linux using USB/DVD and explore the desktop environment and system features. 2. Exploring Linux Architecture and Distributions Study Unix/Linux architecture, identify Linux distributions, and explore GNU utilities. 3. Working with Terminal and Shell Basics Start the shell, understand shell prompts, command syntax, and use man and help pages. 4. File System Navigation Commands Perform directory and file navigation using pwd, cd, ls, tree, and find. 5. Directory and File Management Create, delete, and manage directories and files using mkdir, rmdir, touch, and rm. 6. File Handling and Viewing Commands Use commands like cat, more, less, file, wc, od, and head / tail. 7. File Manipulation and Comparison Perform file copy, move, comparison, and linking using cp, mv, cmp, diff, comm, and ln.	

	8. Compression and Archiving Create and extract compressed files using gzip, gunzip, zip, unzip, and tar. 9. General Purpose Utility Commands Practice utility commands such as cal, date, echo, printf, who, uname, tty, and passwd. 10. Linux File Permissions and Security Understand and modify file permissions and ownership using chmod, chown, chgrp, umask, and group management.	
	Module 2 (30 hours):	
	1. Linux Security and User Privileges Study Linux security concepts, role of root user, use of sudo, password management, and secure access using ssh. 2. Networking and Remote Access Commands Perform networking operations using commands such as who, whoami, ping, telnet, ftp, and ssh. 3. Working with vi Editor Create, edit, save, and manage files using the vi editor and its command modes. 4. Text Processing using sed and awk Perform basic text editing, pattern matching, and report generation using sed and awk. 5. Simple Filters and I/O Redirection Use filters like head, tail, cut, paste, sort, grep, uniq, tr, and implement input/output redirection. 6. Shell Scripting Basics Write shell scripts using variables, user input, exit status, arithmetic operations, and conditional statements (if). 7. Looping and Logical Constructs in Shell Scripts Implement looping constructs (for, while, until) and logical operators in shell scripting. 8. Process Management Commands Manage system processes using commands such as sh, ps, kill, nice, and renice. 9. Job Scheduling using Linux Commands Schedule and manage jobs using at, batch, and cron table entries. 10. Compiler Installation and Basic Programming Install and configure C, C++, Java, and Python compilers/interpreters and write basic programs in C and Python.	
10	Text Books - Linux Command line and Shell Scripting Bible, Richard Blum, Wiley India. - Unix: Concepts and Applications, Sumitabha Das, 4th Edition, McGraw Hill. - Official Ubuntu Book, Matthew Helmke& Elizabeth K. Joseph with Jose Antonio Rey and Philips Ballew, 8th Ed.	
11	Reference Books - Linux Administration: A Beginner's Guide, Fifth Edition, Wale Soyinka, Tata McGraw-Hill, 2008. - Linux: Complete Reference, Richard Petersen, 6th Edition, Tata McGraw-Hill - Beginning Linux Programming, Neil Mathew, 4th Edition, Wiley Publishing, 2008.	
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%
13	The internal evaluation will be determined by the completion of	A Semester End Practical Examination of 2 hours duration for 30 marks as per the

	practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
	Total: 20 marks	Total: 30 Marks												
14	Format of Question Paper: Total Marks: 30 Duration: 2 Hours <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 25%;">Question</th><th style="width: 50%;">Practical Question Based On</th><th style="width: 25%;">Marks</th></tr> </thead> <tbody> <tr> <td>Q.1</td><td>Module 1</td><td>12</td></tr> <tr> <td>Q.2</td><td>Module 2</td><td>12</td></tr> <tr> <td>Q.3</td><td>Viva</td><td>06</td></tr> </tbody> </table>		Question	Practical Question Based On	Marks	Q.1	Module 1	12	Q.2	Module 2	12	Q.3	Viva	06
Question	Practical Question Based On	Marks												
Q.1	Module 1	12												
Q.2	Module 2	12												
Q.3	Viva	06												

Name of the Course: Statistics with R Programming Practical

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: R Programming and Statistical Analysis is a comprehensive course designed to introduce students to the R programming language and its applications in statistical computing, data analysis, and visualization. The course covers the fundamentals of R programming, data structures, functions, statistical techniques, regression analysis, probability distributions, and graphical representation of data. It enables students to analyze, interpret, and visualize real-world datasets effectively. Relevance: R is one of the most widely used programming languages in data science, statistics, machine learning, business analytics, finance, healthcare, and academic research. Learning R equips students with practical skills required for data-driven decision-making and computational statistics. Usefulness: ● Develops programming skills in R. ● Enhances statistical analysis capabilities. ● Supports data visualization and interpretation. ● Enables handling and analysis of real-world datasets. ● Prepares students for advanced courses in Data Science, Artificial Intelligence, and Machine Learning. Application: The knowledge of R Programming is applicable in: ● Data Science and Analytics ● Machine Learning ● Business Intelligence ● Financial Analysis

		● Healthcare Analytics Interest: The course provides hands-on experience in programming and statistical analysis using real-world datasets. Students gain practical exposure to data visualization, predictive modeling, and statistical computing, making the subject highly engaging and career-oriented. Connection with Other Courses: This course is closely related to: ● Python Programming ● Data Science ● Machine Learning ● Artificial Intelligence ● Database Management Systems ● Business Analytics ● Data Mining ● Big Data Analytics ● Research Methodology ● Probability and Statistics Demand in the Industry: R Programming professionals are highly sought after in industries such as: ● IT Companies ● Banking and Finance ● Healthcare ● Insurance ● Pharmaceutical Companies ● E-commerce ● Research Organizations ● Government Agencies ● Manufacturing ● Educational Institutions Job Prospects: After completing this course, students can pursue careers as: ● Data Analyst ● Statistical Analyst ● Business Analyst ● Data Scientist (Entry Level) ● Research Analyst ● Machine Learning Associate ● Financial Analyst ● Market Research Analyst ● Bioinformatics Analyst ● Business Intelligence Executive ● Data Visualization Specialist ● Junior Data Engineer
2	Vertical:	SEC
3	Type:	Practical

4	Credits:	2 credits
5	Hours Allotted:	60 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): After successful completion of this course, students will be able to: CO1: Understand the fundamentals of R programming and the RStudio environment. CO2: Develop R programs using variables, operators, control statements, data structures, and user-defined functions. CO3: Apply statistical methods such as descriptive statistics, probability distributions, and regression analysis using R. CO4: Create and interpret various graphical representations for effective data visualization. CO5: Analyze real-world datasets and generate meaningful statistical reports using R programming. CO6: Apply R programming techniques in data science, research, business analytics, and decision-making applications.	
8	Course Outcomes (OC): After successful completion of this course, students will be able to: OC1: Demonstrate proficiency in writing and executing R programs for computational and statistical problems. OC2: Utilize R data structures, functions, and built-in libraries for efficient data manipulation and analysis. OC3: Perform descriptive and inferential statistical analyses, including regression and probability distributions. OC4: Design informative charts and graphs to visualize and communicate analytical results effectively. OC5: Apply R programming skills to solve real-world problems in data analytics, research, and business intelligence. OC6: Develop practical competency in statistical computing and data visualization, preparing for higher studies and industry careers in Data Science and Analytics.	
9	Modules:-	
	Module 1 (30 hours):	
	Introduction to R & RStudio To understand the fundamentals of R programming, install and configure R and RStudio, and execute basic R programs.	
	Variables and Data Types To learn how to declare variables, use different data types, perform type conversion, and manage variables in R.	
	Operators in R To understand and apply arithmetic, relational, logical, assignment, and special operators in R programming.	
	Decision Making To implement decision-making constructs such as if, if-else, nested if, and switch() statements for solving logical problems.	
	Loops in R To understand and implement iterative statements such as for, while, and repeat loops along with loop control statements.	

	Date and Time Functions To perform date and time operations using built-in R functions and calculate differences between dates and times. Vectors To create, manipulate, and perform various operations on vectors, the basic data structure in R. Matrices To create matrices and perform matrix operations including addition, multiplication, transpose, determinant, and inverse. Arrays and Lists To understand multidimensional arrays and lists, and perform creation, manipulation, and access operations. Data Frames and User-Defined Functions To create and manipulate data frames, import/export datasets, and develop user-defined functions for reusable programming.
	Module II (30 hours): String Manipulation To perform string processing operations including concatenation, extraction, searching, replacement, and formatting using built-in R functions. Descriptive Statistics To compute and interpret descriptive statistical measures such as mean, median, mode, variance, standard deviation, range, and quartiles. Linear Regression To develop and analyze simple linear regression models for studying relationships between variables and making predictions. Multiple Regression To build and evaluate multiple regression models using two or more independent variables for predictive analysis. Normal Distribution To understand the properties of the normal distribution and perform probability calculations using R distribution functions. Binomial Distribution To apply binomial probability distribution functions and simulate discrete probability experiments using R. Frequency Distribution Tables To create and analyze frequency distribution tables for organizing and summarizing categorical and numerical data. Contingency Tables

	To construct and analyze contingency tables for studying relationships between categorical variables using cross-tabulation and chi-square tests. Data Visualization To create and customize graphical representations such as bar charts, pie charts, histograms, line graphs, box plots, and scatter plots for effective data analysis. Statistical Data Analysis Project To apply R programming concepts, statistical techniques, regression analysis, and data visualization methods to analyze real-world datasets and generate meaningful reports.													
10	Text Books 1. Statistical Programming in R, K.G. Srinivasa G.M. Siddesh, Chetan Shetty , Oxford University Press, 2017 2. Learning R: A Language for Data Analytics and Visualization, Sybgen Learning, R. K. Maurya, 2021 3. Introduction to Statistics and Data Analysis With Exercises, Solutions and Applications in R: Heumann, Christian, Schomaker, Michael, Shalabh, Publisher” Springer 2016													
11	Reference Books 1. Learning R Programming, Kun Ren, Packt Publishing, 2018 2. R Programming for Statistics and Data Science(Video), 365 Careers, Packt, 2018 3. R Programming Fundamentals, Kaelen Medeiros, Oreily-Packt Publishing													
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%												
13	The internal evaluation will be determined by the completion of practical tasks and the submission of corresponding write-ups for each session. Each Module practical exercise completed within prescribed time holds a value of 10 marks.	A Semester End Practical Examination of 2 hours duration for 30 marks as per the paper pattern given below. Certified Journal is compulsory for appearing at the time of Practical Exam												
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Question	Practical Question Based On	Marks												
Q.1	Module 1	12												
Q.2	Module 2	12												
Q.3	Viva	06												

Ability Enhancement Course (AEC)

Name of the Course: Modern Indian Language - II

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: An Academic & Professional Skills subject introduces foundational abilities for university success and career readiness, blending critical thinking, research, and communication with practical workplace competencies like teamwork, time management, and technical literacy, bridging the gap between study and employment by focusing on analysis, effective argument, and adaptability for lifelong learning. Relevance: Academic and professional skills share significant overlap and are highly relevant across various subjects and professions. Academic skills form the theoretical and analytical foundation, while professional skills are the practical application of that knowledge and the necessary soft skills for real-world scenarios. The key is that academic skills provide the 'roots' (knowledge, theory, structure), while professional skills allow the 'tree' to grow and adapt in a working environment. For example: ● A student who develops strong analytical skills in a science class will use those exact skills to analyze market data in a business career. ● Group projects in university build the teamwork and collaboration abilities needed to function effectively in cross-functional teams at a company. Ultimately, the most effective professionals are those who successfully combine a solid academic foundation with practical, real-world experience and professional soft skills. Usefulness: Usefulness of Academic Skills (Foundation) ● Problem Solving & Critical Thinking: Analyzing evidence, distinguishing fact from opinion, and forming reasoned conclusions. ● Research & Literacy: Understanding complex texts, conducting thorough research, and applying accuracy to tasks. ● Organization: Managing multiple projects, scheduling, and meeting deadlines efficiently. ● Technical Literacy: Handling digital tools and platforms essential for modern operations. Usefulness of Professional Skills (Application) ● Communication: Effective speaking, writing, and non-verbal cues for clear interactions and building relationships. ● Teamwork & Collaboration: Working effectively in groups to achieve common goals. ● Adaptability & Resilience: Adjusting to new situations, challenges, and learning new things. ● Leadership & Initiative: Mentoring, proposing new ideas, and driving projects forward. ● Emotional Intelligence: Understanding and managing your own

		and others' emotions for better workplace dynamics Application: ● In Education: Skills like research, data interpretation, and academic writing are foundational for assignments, projects, and thesis work. ● In Careers: They transition directly to workplace tasks, from analytical problem-solving in engineering to communication in marketing, enhancing employability. ● Skill Subjects: Some curricula (like CBSE) offer specific skill-based subjects (e.g., IT, Marketing) that integrate these competencies, providing practical application. Interest: Common examples of interest areas include: ● Sciences (Biology, Chemistry, Physics, Environmental Sciences) ● Mathematics & Engineering (Applied Math, Computer Science, Mechanical Engineering, Data Analysis) ● Humanities (History, Literature, Philosophy, Languages) ● Business & Economics (Management, Finance, Accounting, Marketing) ● Social Sciences (Psychology, Sociology, Political Science) ● Arts & Design (Graphic Design, Performing Arts, Creative Writing) ● Health Sciences (Nursing, Medicine, Public Health) Connection with Other Courses: Academic and professional skills subjects serve as connecting links to academic disciplines and bridge the gap between theoretical knowledge and practical workplace needs, enhancing both educational foundations and career prospects. Connection of Academic Skills with Other Courses Academic skills are the foundational competencies that support learning across all disciplines. They are integrated into other courses by: ● Providing a foundation: Subjects like critical thinking and information literacy (ability to find, assess, and use information) are essential for success in any course, from science to humanities. ● Enhancing core competencies: Communication skills (writing, verbal presentation) are crucial for all academic work, such as writing essays, reports, or delivering presentations in any subject. ● Developing research abilities: Courses that teach research methodologies and analytical skills enable students to conduct in-depth studies in various fields, contributing to the academic discipline's body of knowledge. ● Promoting logical thinking: Academic studies emphasize developing logical reasoning and problem-solving, which are universally applicable to subjects like mathematics, philosophy, and engineering. Connection of Professional Skills with Other Courses Professional skills subjects connect academic studies to the practical
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		requirements of the job market, making education holistic and job-ready. ● Practical Application: Professional courses translate theoretical knowledge from academic disciplines into practical, job-specific skills. For example, a student might learn business theory in an academic course and then apply those principles through a professional course in project management or financial modeling. ● Industry Relevance: These courses are often designed with industry input, ensuring that the skills taught (e.g., specific software engineering techniques, digital literacy, business intelligence) are current and relevant to employers. ● Transferable Skills Development: Courses often focus on a range of "soft" professional skills that are highly valued across all industries, regardless of the core academic subject: ○ Communication & Teamwork: Essential for collaboration in any workplace. ○ Time Management: Key for meeting deadlines in professional projects. ○ Leadership: Useful for career advancement in any field. ○ Adaptability & Creativity: Necessary for navigating a continuously evolving job market. ● Career Advancement: Combining academic degrees (e.g., a B.Sc. in Computer Science) with professional certifications (e.g., an IT certification like AWS or Cisco) gives candidates a significant edge in the job market and helps accelerate long-term career growth. Demand in the Industry: The industry demands a blend of advanced technical (academic) skills, such as AI and data analytics, and robust professional (soft) skills, including critical thinking, adaptability, and communication. Employers increasingly prioritize this combination over academic qualifications alone. In-Demand Academic & Technical Skills These skills often stem from specialized fields of study and directly relate to core job functions. ● Artificial Intelligence (AI) and Machine Learning (ML): Expertise in ML algorithms, neural networks, and AI tools (TensorFlow, PyTorch) is highly sought after across healthcare, finance, and retail. Prompt engineering and AI risk management are emerging needs. ● Data Science and Analytics: The ability to collect, interpret, analyze, and visualize complex data is critical for informed business decisions. Proficiency in tools and languages like Python, R, SQL, Excel, and Tableau is essential. ● Cloud Computing: Knowledge of cloud platforms (AWS, Azure, Google Cloud) and architecture is in high demand as businesses migrate their infrastructure to the cloud for scalability and efficiency. ● Cybersecurity: With the rise in cyber threats, skills in network security, encryption, ethical hacking, and risk assessment are crucial for protecting digital infrastructure.
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		● Software and Web Development: Core programming languages (Java, Python, JavaScript, C++), knowledge of development processes, and expertise in areas like DevOps and UX/UI design remain fundamental to the tech industry's backbone. ● Digital Marketing: Skills in SEO/SEM, content marketing, social media management, and data analytics (Google Analytics) are vital for online brand awareness and business growth. ● Green Skills: The transition to a sustainable economy has created demand for skills in areas like renewable energy design, carbon accounting, and sustainability management. In-Demand Professional Skills Often called "power skills" or "soft skills," these human-centric abilities are essential for collaboration, problem-solving, and career advancement in any sector. ● Analytical and Critical Thinking: The ability to break down complex problems, evaluate data, and make well-reasoned, data-driven decisions is a top priority for employers. ● Adaptability and Flexibility: In a rapidly changing work environment driven by new technology, professionals who can quickly adapt to new tools, roles, and ideas are highly valued. ● Communication: Clear and concise written and verbal communication, active listening, and negotiation skills are essential for effective teamwork and client interaction. ● Creativity and Innovation: Employers seek individuals who can think differently, foster innovation, and develop novel solutions to challenges, driving differentiation and growth. ● Leadership and Management: The ability to inspire, motivate, and guide others, along with strong project management and organizational skills, is key to team success. ● Problem-Solving: This is vital for navigating unexpected challenges and high-pressure environments where timely decisions can significantly impact outcomes. ● Continuous Learning: A mindset of lifelong learning and a willingness to upskill and acquire new competencies is necessary to stay relevant as job requirements evolve. Job Prospects: Both academic study and professional development focus on skills that are essential for career success in high-demand fields. The job prospects for individuals with a strong foundation in these skills are generally excellent, particularly in technology, data, and business sectors.
2	Vertical:	AEC
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks
7	Course Objectives(CO): CO 1. To help learners develop their soft skills and develop their personality together with their technical skills.	

	CO 2. To equip them to excel in real work environment and corporate life. CO 3. Understand various issues in personal and professional communication and learn to overcome them. CO 4. Developing professional, social and academic skills to harness hidden strengths, capabilities and knowledge
8	Course Outcomes (OC): After successful completion of this course, students would be able to - OC 1. To know about various aspects of soft skills and learn ways to develop personality OC 2. Understand the importance and type of communication in a personal and professional environment. OC 3. To provide insight into much needed technical and non-technical qualities in career planning. OC 4. Learn about Leadership, team building, decision making and stress management
9	Modules:- Module 1 (15 hours): Academic and Professional skills.-Theory Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter Job Interviews: Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews Group Discussion: Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits Academic and Professional Skills: Professional Presentation: Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation Module 2 (15 hours): Creativity at Workplace: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method. Capacity Building: Learn, Unlearn and Relearn: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams. Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts Stress and Time Management: Stress, Sources of Stress, Ways to Cope with Stress
10	Text Books 1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India
11	Reference Books 1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press 2. Business Communication, Shalini Kalia, Shailja Agrawal, Wiley India 3. Soft Skills - Enhancing Employability, M. S. Rao, I. K. International 4. Cornerstone: Developing Soft Skills, Sherfield, Pearson India
12	Internal Continuous Assessment: 40% Semester End Examination: 60%

13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.		
	Total: 20 marks	Total: 30 Marks		
14	Format of Question Paper:			
	Total Marks: 30		Duration: 1 Hour	
	Question	Based On	Options	Marks
	Q.1	Module 1	Any 2 out of 4	10
	Q.2	Module 2	Any 2 out of 4	10
	Q.3	Module 1 & 2	Any 2 out of 4	10

Value Education Course (VEC)

Name of the Course: Green Enterprise Management and Sustainability

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: This course introduces the concepts of Green Information Technology (Green IT) and sustainable enterprise management. It covers Green Business Process Management, Green Enterprise Architecture, Green Information Systems, Green IT governance, environmental compliance, sociocultural aspects of Green IT, and emerging sustainable technologies. The course enables students to understand how Information Technology can contribute to environmental sustainability while improving organizational efficiency and reducing carbon footprints. Relevance: With increasing global emphasis on sustainable development, organizations are adopting Green IT practices to reduce energy consumption, electronic waste, and greenhouse gas emissions. This course equips students with the knowledge and skills required to implement environmentally responsible IT solutions and support sustainable digital transformation initiatives. Usefulness: The course helps students understand sustainable business processes, Green IT governance, environmental standards, compliance frameworks, carbon management, and emerging green technologies. It prepares learners to participate in sustainability initiatives and implement eco-friendly IT solutions in organizations. Application:

		● Design sustainable business processes using Green BPM principles. ● Implement Green Enterprise Architecture and Green Information Systems. ● Apply Green IT governance and environmental compliance standards. ● Conduct Green audits and carbon emission assessments. ● Utilize emerging technologies for sustainable and energy-efficient computing. Interest: The course provides an interdisciplinary perspective by integrating Information Technology, environmental sustainability, business management, and emerging technologies. Students gain practical knowledge of Green IT practices that are increasingly adopted across industries worldwide. Connection with Other Courses: ● Green Computing ● Business Process Management ● Enterprise Resource Planning (ERP) ● Environmental Studies Demand in the Industry: Industries across sectors are focusing on Environmental, Social, and Governance (ESG) goals, digital sustainability, and carbon neutrality. Organizations require professionals skilled in Green IT, sustainability management, environmental compliance, cloud sustainability, and Green Enterprise Architecture to meet regulatory requirements and improve operational efficiency. Job Prospects: ● Green IT Consultant ● Sustainability Analyst ● ESG Analyst ● Environmental Compliance Officer ● Green Business Process Analyst ● Green Systems Analyst ● IT Governance Executive ● Carbon Management Consultant ● Enterprise Solutions Architect ● Sustainable Technology Consultant
2	Vertical:	OE
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks

7	Course Objectives(CO): CO1. To understand the principles and practices of Green Business Process Management and sustainable enterprise systems. CO2. To develop knowledge of Green Enterprise Architecture, Green Information Systems, and Green IT governance. CO3. To study sociocultural, ethical, organizational, and security aspects of Green Information Technology. CO4. To understand Green compliance standards, environmental protocols, Green audits, and carbon emission management. CO5. To explore emerging Green ICT technologies, renewable energy, cloud computing, nanotechnology, and quantum computing for sustainable development. CO6. To apply Green IT concepts and sustainable practices for designing environmentally responsible enterprise solutions.
8	Course Outcomes (OC): After successful completion of this course, students would be able to: OC1. Explain the concepts of Green Business Process Management, Green Enterprise Architecture, Green Information Systems, and Green IT governance. OC2. Analyze environmental compliance standards, Green audits, sociocultural issues, and ethical practices related to Green IT. OC3. Evaluate emerging Green ICT technologies and sustainable computing solutions for reducing environmental impact. OC4. Apply Green IT principles to design sustainable, energy-efficient, and environmentally responsible enterprise systems and business processes.
9	Modules:- Module 1 (15 hours): Green Business Process Management: Introduction, Green Reengineering, Green Process, Green BPM and standards, Green Business Analysis, Green Requirements Modelling, Green IT Governance, Green Business Process and Applications, QoS, Achieving green BPM, Green Mobile Business Process, Digital Library Green Enterprise Architecture: Green IT and organizational Systems, Aspects of Green Solutions Architecture, Contents and Integration with Service-Oriented Architecture, Green Supply Chain Management, Green Portals in Green Enterprise Architecture, Environmental Intelligence Green Information Systems(GIS): Design and Development Models: Describing GIS, GIS Requirements Module 2 (15 hours): Sociocultural Aspects of Green IT: Green IT's Social Impact, Learning Organization, Green Social Stakeholders, Role-Based View of Green IT, Green User Practices, Attitude and Subjectivity in Green IT, Green IT Ethics and Code of Conduct, Privacy and Security of Green Information, Green Washing, Communications in Green Transformation Projects, Green HR and Changing Organizational Structures, Green-Collar Workers: Roles and Skill Sets, Green Virtual Communities Green Compliance: Protocols, Standards, and Audits: Protocols and Standards, ISO 14000-2004 Standard, Various initiatives by stakeholders, Green Audits and types, Audit and use of Carbon emission management software

	Emerging Carbon Issues: Technologies and Future: Future Carbon Landscape, Green ICT and Technology Trends, Cloud Computing, Nanotechnology, Quantum computing, Renewable energies, eco-design, Collaborative environmental intelligence		
10	Text Books 1. Green Information and Communication Systems for a Sustainable Future, Rajshree Srivastava, 2. Sandeep Kautish, Rajeev Tiwari. CRC Press, 2020		
11	Reference Books 1. Sustainability Awareness and Green Information Technologies, Tomayess Issa, Springer, 2021 2. Environmental Sustainability Role of Green Technologies, P. Thangavel, and G. Sridevi, Springer, 2016		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		Duration: 1 Hour
	Question	Based On	Options
	Marks		
	Q.1	Module 1	Any 2 out of 4
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1 & 2	Any 2 out of 4	10

Co-curricular Courses

Name of the Course: NATIONAL SERVICE SCHEME-II (NSS-II)

Sr. No.	Heading	Particulars
1	Description the course:	Introduction: National Service Scheme (NSS) is a student-oriented programme that provides opportunities to understand community needs and participate in social development activities. This course focuses on socio-economic surveys, special campaigning, leadership, community interaction, programme planning, voluntary organizations, government schemes, communication and documentation. It provides students with practical exposure to community-based activities and develops social responsibility, leadership and teamwork. Relevance: Helps students understand the social and economic conditions of communities. Develops awareness of major community problems and possible solutions. Provides practical knowledge of survey, planning and implementation. Develops leadership, communication and teamwork skills.

		Connects academic learning with community development. Promotes social responsibility and active citizenship. Introduces students to the role of VO/GO and government welfare schemes. Usefulness: ● Helps students conduct socio-economic surveys systematically. ● Develops skills in questionnaire preparation and data collection. ● Improves leadership and team-building abilities. ● Helps students plan and implement community programmes. ● Develops conflict-resolution and interpersonal skills. ● Improves report writing and documentation skills. ● Creates awareness about government schemes and welfare organizations. Application: ● Conducting socio-economic surveys in adopted villages or communities. ● Preparing questionnaires for community surveys. ● Organizing NSS special camps and campaigns. ● Conducting cleanliness, health, environmental and awareness programmes. ● Planning and implementing need-based community projects. ● Working with voluntary and government organizations. ● Preparing activity reports, annual reports and press notes. ● Applying communication and leadership skills during community interaction. Interest: The course develops students' interest through field-based learning and practical community participation. Students interact directly with individuals and groups, participate in special camps, organize awareness activities, solve community problems and work as a team. Such experiences make learning more meaningful and encourage students to contribute to society. Connection with Other Courses: This course has interdisciplinary connections with: ● Communication Skills – verbal, non-verbal and interpersonal communication. ● Data Management/Statistics – data collection, classification, analysis and presentation. ● Management – planning, organizing, coordination and evaluation. ● Environmental Studies – environmental awareness and community development. ● Social Sciences – society, social problems and community development. ● Computer Applications – digital documentation, data processing and report preparation. ● Entrepreneurship and Employability Skills – leadership, teamwork, problem-solving and initiative. ● Constitutional Studies – citizenship, social responsibility and welfare. Demand in the Industry: The skills developed through NSS are valuable across educational institutions, NGOs, social enterprises, government programmes and
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		corporate social responsibility (CSR) activities. Organizations increasingly require individuals who can communicate effectively, work in teams, conduct surveys, coordinate programmes, prepare documentation and interact with communities. Job Prospects: After developing the skills covered in this course, students can contribute to or pursue opportunities in areas such as: • NGOs and Voluntary Organizations • Government and Welfare Departments • Community Development Projects • Corporate Social Responsibility (CSR) • Social Research and Survey Organizations • Project Coordination • Community Outreach • Social Work and Development Programmes • Educational and Youth Development Organizations • Field Survey and Data Collection Projects
2	Vertical:	CC
3	Type:	Theory
4	Credits:	2 credits
5	Hours Allotted:	30 hours
6	Marks Allotted:	50 Marks (30+20)
7	Course Objectives(CO): CO1.Understand the concepts and procedures of socio-economic surveys, community assessment and special campaigning activities. CO2.Develop leadership, teamwork, communication and conflict-resolution skills through individual, group and community-based activities. CO3.Apply programme planning, implementation, evaluation and community participation techniques for need-based NSS activities. CO4.Demonstrate skills in working with voluntary/government organizations, understanding welfare schemes, communication and systematic documentation of NSS activities.	
8	Course Outcomes (OC): After successful completion of this course, students will be able to: OC1.Conduct basic socio-economic surveys by designing questionnaires, collecting data, analyzing information and preparing survey reports. OC2.Demonstrate leadership, teamwork, communication and conflict-resolution skills while working with individuals, groups and communities. OC3.Plan, implement and evaluate need-based community programmes and NSS activities using appropriate planning and feedback techniques. OC4.Prepare and maintain NSS-related documentation, including activity reports, annual reports, basic accounts and press notes, and identify the role of VO/GO and government schemes in community development.	
9	Modules:- Module 1 (15 hours): Socio-Economic Survey: Meaning and need of socio-economic survey; Design of questionnaire; Data collection methods; Data analysis; Preparation of survey report Special Campaigning Activity: Concept of camp; Identification of community problems; Importance of group living; Team building; Adoption of village; Planning for camp; Pre-camp, during-camp and post-camp activities Training, Orientation and Leadership: Training and orientation of NSS programme unit in college; Leadership training; Formation of need-based programmes; Concept and importance of Campus to Community (C to C) activities	
	Module 2 (15 hours):	

	Working with Individual, Group and Community: Ice-breaking activities; Interaction games; Group interaction; Conflict resolution; Communication and cooperation in community work Programme Planning: Concept of planning; Features of planning; Requirements for successful implementation of programmes; Programme flow charting; Feedback and evaluation Voluntary Organizations (VO), Government Organizations (GO) and Community Development: Meaning of VO; Legal setup and formation of VO; Functions and functioning of VO; Sources of functioning/resources; VO and NSS integration; Case study of any VO/GO/Welfare Department; Government schemes for community development; Schemes of different departments, provisions and examples Communication Skills and Documentation: Verbal and non-verbal communication; Activity report writing; Basics of NSS accounting; Annual report preparation; Press note preparation		
10	Text Books 1. National Service Scheme – Manual / NSS Programme Guidelines , Ministry of Youth Affairs and Sports, Government of India. 2. National Service Scheme – A Guide for NSS Volunteers , Ministry of Youth Affairs and Sports, Government of India. 3. Social Work and Community Development , relevant university-level introductory text. 4. Community Organization and Development Practice , relevant academic text. 5. Communication Skills , relevant undergraduate-level textbook.		
11	Reference Books 1. Methods in Social Research – relevant reference text for survey and fieldwork. 2. Communication Skills and Soft Skills – relevant undergraduate reference book. 3. Indian Society and Social Change – relevant reference text. 4. Indian Constitution and Social Justice – relevant reference book. 5. Government of India publications on Rural Development and Social Welfare Schemes – for current government programmes and provisions.		
12	Internal Continuous Assessment: 40%	Semester End Examination: 60%	
13	Continuous Evaluation through: Class Test: 10 marks Assignments: 5 marks Active Participation: 5 marks	Evaluation through: A Semester End Theory Examination of 1 hour duration for 30 marks as per the paper pattern given below.	
	Total: 20 marks	Total: 30 Marks	
14	Format of Question Paper:		
	Total Marks: 30		
	Duration: 2 Hours		
	Question	Based On	Options
	Marks		
Q.1	Module 1	Any 2 out of 4	10
Q.2	Module 2	Any 2 out of 4	10
Q.3	Module 1&2	Any 2 out of 4	10

Letter Grades and Grade Points:

Semester GPA/ Programme CGPA Semester/ Programme	% of Marks	Alpha-Sign/ Letter Grade Result	Grading Point
9.00 - 10.00	90.0 – 100	O (Outstanding)	10
8.00 - < 9.00	80.0 - < 90.0	A+ (Excellent)	9
7.00 - < 8.00	70.0 - < 80.0	A (Very Good)	8
6.00 - < 7.00	60.0 - < 70.0	B+ (Good)	7
5.50 - < 6.00	55.0 - < 60.0	B (Above Average)	6
5.00 - < 5.50	50.0 - < 55.0	C (Average)	5
4.00 - < 5.00	40.0 - < 50.0	P (Pass)	4
Below 4.00	Below 40.0	F (Fail)	0
Ab (Absent)	----	Ab (Absent)	0

Committee for creation of Syllabus

Sr.no	Name Of the Faculty	Category	Designation	Signature
1	Mrs. Vibha. Vilas. Gawande	12.5 (1)	HOD/ Chairman	
2	Mr. Pranam Prakash. Kambli	12.5 (2)	Member	
3	Mr. Siddhivinayak V. Sawant		Member	
4	Miss. Tanvi Dilip Shinde		Member	
3	Mr. Deelip A. Patil	12.5 (3)	Member	Online
4	Dr. Amol Bhanudas Devale		Member	Online
5	Dr. Rajendra patil	12.5 (4)	Member	Online
6	Mr. Rajshekhar Patil	12.5 (5)	Member	Online
7	Mr. Harshraj Sadwelkar	12.5 (6)	Member	Online
8	Dr. Anuja Gharpure	12.5 (7)	Member	Online