

Sant Gadge Baba Amravati University Amravati
B.Sc. Cyber Security (Semester-I) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Credits		Maximum Marks				Total marks	Minimum passing Marks		
				L	T	P	Total Hrs			External		Internal			External	Internal	Total
										Th	Pr	Th	Pr				
1	AEC	N1CS1	English Composition and Communication	1	1	-	02	02	02	30	-	20	-	50	12	08	20
2	Core	N1CS2	Computer Network	3	-	-	03	03	03	50	-	30	-	80	20	12	32
3	Core	N1CS3	Problem Solving Using C	3	-	-	03	03	03	50	-	30	-	80	20	12	32
4	Core	N1CS4	Data Structure	3	-	-	03	03	03	50	-	30	-	80	20	12	32
5	SEC/LAB	N1CS5	Hardware and Networking LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
6	SEC/LAB	N1CS6	C- Programming LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
7	SEC/LAB	N1CS7	Data Structure LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
8	IKS	N1CS8	Indian Knowledge System	2	-	-	02	02	02	College Level Theory				50	-	20	20
9	VAC	N1CS9	Environmental Science	2	-	-	02	02	02	College Level Theory				50	-	20	20
10	OE-I	N1CS10	*MOOCS/SWYAM/NEPTEL/GOEC Basket Courses	-	-	1	02	01	-	College Assessment				50	-	20	20
11	Assessment Hours						06										
TOTAL							35	22						590			
Sem -I Total Credit		22					Total Marks		590								

Internal Assessment Guidelines

For 30 Marks Internal (Theory) – Test 1 = 05M , Test 2 = 05M, Assignment/Seminar/Paper-Presentation =10M, Common Test Based on Whole Syllabus = 10M

For 20 Marks Internal (Theory) – Test 1 = 05M , Test 2 = 05M, Common Test Based on Whole Syllabus = 10M

For 25 Marks Internal (Practical) – Mini Project = 10M, Record = 05M, Skill Test=05M, Attendance and Performance=05M

For 50 Marks College Level Theory – Exam =40M, Assignment=10M

OE-I Assessment – Certificate Submission – 20M, Assignment Submission-20M, Viva-Voce-10M if Subject Choose from GOEC Basket then 40marks paper and 10marks Assignment should be Conducted on College Level

*Faculty wise basket other than faculty core subject.

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Sant Gadge Baba Amravati University Amravati

B.Sc. Cyber Security (Semester-II) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Credits	Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Total Hrs			Maximum Marks				Total marks	Minimum passing Marks		
				L	T	P	Total Hrs				External		Internal			External	Internal	Total
											Th	Pr	Th	Pr				
1	AEC	N2CS1	Communication Skills	1	1	-	02	02	02	30	-	20	-	50	12	08	20	
2	Core	N2CS2	Computer Organisation and Architecture	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
3	Core	N2CS3	Database Management System	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
4	Core	N2CS4	Object Oriented Programming using JAVA	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
5	SEC/LAB	N2CS5	DBMS-LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20	
6	SEC/LAB	N2CS6	JAVA Programming –LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20	
7	SEC	N2CS7	Design Thinking and Innovation	2	-	-	02	02	02	30	-	20	-	50	12	08	20	
8	VAC	N2CS8	Cyber Security Ethics	2	-	-	02	02	02	College Level Theory			50	-	20	20		
9	OE-II	N2CS9	MOOCS/SWYAM/NEPTEL/ GOEC Basket Courses*	-	-	1	02	01		College Assessment			50	-	20	20		
10	Assessment Hours						06											
TOTAL							35	22				540						
Sem -II Total Credit		22					Total Marks		540									

Internal Assessment Guidelines

For 30 Marks Internal (Theory) – Test 1 = 05M , Test 2 = 05M, Assignment/Seminar/Paper-Presentation =10M, Common Test Based on Whole Syllabus = 10M

For 20 Marks Internal (Theory) – Test 1 = 05M , Test 2 = 05M, Common Test Based on Whole Syllabus = 10M

For 25 Marks Internal (Practical) – Mini Project = 10M, Record = 05M, Skill Test=05M, Attendance and Performance=05M

For 50 Marks College Level Theory – Exam =40M, Assignment=10M

OE-II Assessment – Certificate Submission – 20M, Assignment Submission-20M, Viva-Voce-10M if Subject Choose from GOEC Basket then 40marks paper and 10marks Assignment should be Conducted on College Level

*Faculty wise basket other than faculty core subject.

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Sant Gadge Baba Amravati University Amravati

B.Sc. Cyber Security (Semester-III) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Credits		Maximum Marks				Minimum passing Marks			
				L	T	P	Total Hrs			External		Internal		Total marks	External	Internal	Total
										Th	Pr	Th	Pr				
1	Core	N3CS1	Introduction to Cyber Security	3	-	-	03	03	03	50	-	30	-	80	20	12	32
2	Core	N3CS2	Design and Analysis of Algorithms	3	-	-	03	03	03	50	-	30	-	80	20	12	32
3	Core	N3CS3	Operating Systems	3	-	-	03	03	03	50	-	30	-	80	20	12	32
4	DSE	N3CS4	Professional Elective 1	3	-	-	03	03	03	50	-	30	-	80	20	12	32
5	SEC/LAB	N3CS5	Elective1- LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
6	SEC/LAB	N3CS6	Operating System -LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20
7	SEC/LAB	N3CS7	DAA-LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20
8	CC	N3CS8	Co-Curricular Courses*	-	-	2	04	02	02					30	-	12	12
9	Assessment Hours						03										
TOTAL							35	22					520				
Sem -III Total Credit		22					Total Marks		520								

Professional Elective 1: Cryptography, Cloud Computing

***Health and Wellness, Yoga Education, Sports, Fitness, Cultural Activities, Paper presentation, Conference, Community Engagement, Field Visit, Avshikar, NSD, NSS/NCC and Fine/Applied/Visual/Performing Arts. Minimum District Level Certificate Required.**

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Sant Gadge Baba Amravati University Amravati

B.Sc. Cyber Security (Semester-IV) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Credits	Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Total Hrs			Maximum Marks		Total marks	Minimum passing Marks				
				L	T	P	Pr				Th	Pr		Th	Pr	Th	Pr	Total
1	Core	N4CS1	Entrepreneurship and Start-up Ecosystem	2	-	-	02	02	02	30	-	20	-	50	12	08	20	
2	Core	N4CS2	Wireless and Mobile Security	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
3	Core	N4CS3	Artificial Intelligence & Machine Learning	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
4	Core	N4CS4	Digital Forensics	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
5	DSE	N4CS5	Professional Elective 2	3	-	-	03	03	03	50	-	30	-	80	20	12	32	
6	SEC/LAB	N4CS6	Wireless and Mobile Security-LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20	
7	SEC/LAB	N4CS7	AIML- LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20	
8	SEC/LAB	N4CS8	Digital Forensics – LAB	-	-	3	06	03	-	-	25	-	25	50	10	10	20	
9	Assessment Hours						05											
TOTAL							35	22						520				
Sem -IV Total Credit		22					Total Marks		520									

Professional Elective 2: Legal and Ethical Aspects of Cyber Security, Cyber Attacks and Counter Measures, Ethical Hacking

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Sant Gadge Baba Amravati University Amravati
B.Sc. Cyber Security(Semester-V) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Credits		Maximum Marks				Total marks	Minimum passing Marks		
				L	T	P	Total Hrs			External		Internal			External	Internal	Total
										Th	Pr	Th	Pr				
1	Core	N5CS1	Cyber Threat Intelligence	3	-	-	03	03	03	50	-	30	-	80	20	12	32
2	Core	N5CS2	Secure Systems Administration	3	-	-	03	03	03	50	-	30	-	80	20	12	32
3	Core	N5CS3	Cloud Security	3	-	-	03	03	03	50	-	30	-	80	20	12	32
4	DSE	N5CS4	Professional Elective 3	3	-	-	03	03	03	50	-	30	-	80	20	12	32
5	SEC/LAB	N5CS5	Cloud Security Lab	-	-	2	04	02	-	-	25	-	25	50	10	10	20
6	SEC/LAB	N5CS6	Secure Systems Administration- Lab	-	-	2	04	02	-	-	25	-	25	50	10	10	20
7	SEC/LAB	N5CS7	LAB Based on Elective 3	-	-	2	04	02	-	-	25	-	25	50	10	10	20
8	SEC	N5CS8	Seminar	-	-	1	02	01	-	-	-	-	50	50	-	20	20
9	SEC	N5CS9	Project Phase I	-	-	2	04	02	-	-	-	-	50	50	-	20	20
10	Assessment Hours						05										
TOTAL							35	21						570			
Sem -V Total Credit		21					Total Marks		570								

Professional Elective 3: , Web Security, Network Security, : Cryptocurrency and Block Chain Technology

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Sant Gadge Baba Amravati University Amravati

B.Sc. Cyber Security(Semester-VI) NEP

Sr. No	Type	Subject Code	Subject	Teaching and Learning Scheme					Duration of Exam Hrs	Examination and Evaluation Scheme							
				Teaching Period per week				Credits		Maximum Marks				Total marks	Minimum passing Marks		
				L	T	P	Total Hrs			External		Internal			External	Internal	Total
										Th	Pr	Th	Pr				
1	Core	N6CS1	Malware Analysis	3	-	-	03	03	03	50	-	30	-	80	20	12	32
2	Core	N6CS2	Penetration Testing	3	-	-	03	03	03	50	-	30	-	80	20	12	32
3	Core	N6CS3	Web Application Security	3	-	-	03	03	02	50	-	30	-	80	20	12	32
4	SEC/LAB	N6CS4	Penetration Testing-LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
5	SEC/LAB	N6CS5	Malware Analysis -LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
6	SEC/LAB	N6CS6	Web Application Security -LAB	-	-	2	04	02	-	-	25	-	25	50	10	10	20
7	SEC	N6CS7	Internship	-	-	-	-	02	-					-	-	-	
8	SEC	N6CS8	Project Phase II	-	-	4	08	04	-	-	50	-	50	100	20	20	40
Assessment Hours							06										
TOTAL							35	21					490				
Sem -VI Total Credit		21					Total Marks		490								

Internship will be conducted after Ist semester till Vth semester in vacations for minimum 60 hrs. It's 2 credits will be reflected in final semester credit grade report.

Faculty: Science and Technology

Syllabus Prescribed for Three Year Six Semester UG Programme

B.Sc. CYBER SECURITY [NEP Pattern]

PROGRAM EDUCATIONAL OBJECTIVES (PEO's):

PEO 1: Graduates will demonstrate a deep understanding of cyber-security principles, practices, and technologies.

PEO 2: Graduates will possess critical thinking and problem-solving skills to analyze and solve complex cyber-security issues.

PEO 3: Graduates will exhibit effective communication skills, both oral and written, to convey cyber-security concepts and findings to diverse audiences.

PEO 4: Graduates will demonstrate ethical and professional behavior in their cyber-security practice, adhering to legal and moral standards.

PROGRAM OUTCOMES (PO's):

PO 1: Ability to apply principles of cyber-security to design, implement, and manage secure computing systems.

PO 2: Proficiency in identifying and analyzing cyber-security risks, vulnerabilities, and threats in various technological contexts.

PO 3: Competence in employing cyber-security tools, techniques, and methodologies to protect information assets and ensure data integrity, confidentiality, and availability.

PO 4: Capability to evaluate and recommend cyber-security solutions aligned with organizational needs, compliance requirements, and industry best practices.

PO 5: Understanding of legal, ethical, and societal issues related to cyber-security, and ability to make informed decisions considering these factors.

PROGRAM SPECIFIC OUTCOMES (PSO's):

PSO 1: Ability to apply cryptographic techniques and protocols to secure data transmission and storage.

PSO 2: Proficiency in conducting risk assessments, penetration testing, and forensic analysis to detect and mitigate cyber-security incidents.

PSO 3: Capability to utilize threat intelligence, security analytics, and incident response techniques to detect and respond to cyber-security breaches effectively.

EMPLOYABILITY SKILLS:

After completing a Bachelor of Science (BSc) in Cyber Security, there are numerous employment opportunities available across various sectors. Here are some potential career paths:

1. **Security Operations Center (SOC) Analyst:** Monitoring and analyzing security events and incidents within an organization's IT infrastructure to detect, respond to, and mitigate cyber threats.
2. **Penetration Tester/Ethical Hacker:** Conducting controlled attacks on systems, networks, and applications to identify vulnerabilities and weaknesses, and providing recommendations to improve security.
3. **Security Engineer:** Designing, implementing, and maintaining security solutions such as firewalls, intrusion detection systems, encryption systems, and access controls.
4. **Incident Responder:** Investigating and responding to security incidents, coordinating incident response efforts, and implementing measures to prevent similar incidents in the future.
5. **Security Administrator:** Managing and maintaining security infrastructure, including configuring security settings, administering access controls, and enforcing security policies.
6. **Forensic Analyst:** Investigating cybercrime incidents, collecting and analyzing digital evidence, and providing expert testimony in legal proceedings.
7. **Security Architect:** Designing and implementing secure IT architectures, considering business requirements, risk factors, and emerging technologies.
8. **Cyber-security Educator/Trainer:** Teaching cyber-security concepts, tools, and techniques to students or employees through academic institutions, training programs, or corporate workshops.

SEMESTER-I**Title: ENGLISH COMPOSITION AND COMMUNICATION****Type: AEC****Credits: 02**

Total Marks-50		Course Code: N1CS1	(Total Number of Periods) Hrs
Theory Exam Marks :30	Internal Marks:20		30

COURSE OUTCOME:

At end of the course students would be able to :

1. understand communication skills of English language
2. Formulate/ compose his own sentences and able to speak English Language.
3. collaborate with others students in English.
4. communicate properly their ideas and concepts in English.

Unit	Content
Unit 1:	<ul style="list-style-type: none"> ○ Articles ○ Prepositions ○ Tenses ○ Subject – Verb Agreement (6 Hours)
Unit 2:	<ul style="list-style-type: none"> ○ Meeting People ○ Exchanging Greetings and Taking Leave ○ Introducing Yourself (6 Hours)
Unit 3: Prose	<ul style="list-style-type: none"> ○ The Home Coming – Rabindranath Tagore ○ A Lesson My Father Taught Me – APJ Abdul Kalam ○ How I Became a Public Speaker – George Bernard Shaw (6 Hours)
Unit 4: Poetry	<ul style="list-style-type: none"> ○ The quality of Mercy – William Shakespeare ○ The Mountain and the Squirrel – R.W. Emerson ○ Where the Mind is Without Fear – Rabindranath Tagore (6 Hours)

Skill Enhancement Module: [6 Hours]

Spot Visit and preparing a report – Visit to Super Market, Bus Stand, Railway Station, Bank, Medical Shop, Bakery etc.

Interview of a dignitary and writing a report in dialogue form

TEXT BOOK:

Pathmaker: A Textbook for College Students [ISBN 989354421778] Edited by Board of Editors, SantGadge Baba Amravati University, Amravati. Publisher : Orient BlackSwan Pvt Ltd

Title: Computer Network**Type: Core****Credits: 03**

Total Marks-80		Course Code: N1CS2	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30		45

COURSE OUTCOME:

1. Understand the fundamental concepts of Computer Networks and their applications.
2. Develop problem-solving skills related to network design, implementation, and troubleshooting.
3. Implement network protocols and configure network devices.

Unit	Content
UNIT I: Introduction to Computer Networks	<p>Overview of Computer Networks: Definition and Objectives, Applications and Examples Network Components and Architecture</p> <p>Network Models: OSI Model: Layers and Functions, TCP/IP Model: Layers and Functions, Comparison between OSI and TCP/IP Models</p> <p>Network Topologies: Physical vs. Logical Topologies, Common Topologies: Star, Ring, Bus, Mesh, Hybrid, Advantages and Disadvantages of Each Topology</p> <p>Data Transmission: Analog vs. Digital Signals, Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Bandwidth and Latency Networking Devices: Routers, Switches, Hubs, Bridges, Gateways, Functions and Configurations of Each Device. (12 Hours)</p>
UNIT II: Data Link Layer and Networking Protocols	<p>Data Link Layer Fundamentals: Functions of the Data Link Layer, Framing, Error Detection, and Error Correction, Flow Control Mechanisms.</p> <p>Ethernet: Ethernet Standards and Frame Structure, MAC Addressing and ARP, Ethernet Switching: Basic Concepts and Methods</p> <p>Network Protocols: Introduction to TCP/IP Protocol Suite, IP Addressing: IPv4 and IPv6 Subnetting and CIDR Notation</p> <p>Address Resolution Protocol (ARP): ARP Operation and Table, ARP Spoofing and Security Considerations</p> <p>Virtual LANs (VLANs): Concept of VLANs, VLAN Tagging and Configuration, Benefits and Use Cases(11 Hours)</p>
UNIT III: Network Layer and Transport Layer	<p>Network Layer: IP Routing: Static vs. Dynamic Routing, Routing Protocols: RIP, OSPF, BGP, Network Address Translation (NAT)</p> <p>Transport Layer: TCP vs. UDP: Characteristics and Use Cases, TCP Handshake and Connection Management, Flow Control and Congestion Control in TCP</p> <p>Congestion Control Algorithms: Techniques: Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery, TCP Variants: TCP Reno, TCP Vegas.</p> <p>Quality of Service (QoS): QoS Principles and Mechanisms, Differentiated Services (DiffServ) and Integrated Services (IntServ)</p>

	Network Security Fundamentals: Threats and Vulnerabilities, Basic Security Mechanisms: Firewalls, VPNs, Encryption (11 Hours)
UNIT IV: Application Layer and Emerging Technologies	<p>Application Layer Protocols: HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3, IMAP: Protocols and Uses, DNS: Domain Name System and Resolution Network Applications: Web Browsing, Email Communication, File Transfer, Voice over IP (VoIP) and Streaming.</p> <p>Emerging Technologies: Software-Defined Networking (SDN), Network Function Virtualization (NFV), Internet of Things (IoT) and Its Impact on Networking Network Management: SNMP: Simple Network Management Protocol, Network Monitoring Tools and Techniques.</p> <p>Future Trends in Networking: 5G and Beyond, Network Automation and Artificial Intelligence in Networking. (11 Hours)</p>

TEXT BOOKS:-

1. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2011.
2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson, 2021.

REFERENCE BOOKS:-

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-Hill Education, 2012.
2. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019.
3. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna Publishing House, 2023.
4. Mastering PC Hardware & Networking, Khanna Publishing House, 2024.

Title: PROBLEM SOLVING USING C**Type: Core****Credits: 03**

Total Marks-80		Course Code: N1CS3	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30		45

COURSE OUTCOME:

Upon completion of this course, the students will be able to

1. Describe the basics of digital computer and programming languages.
2. Demonstrate problem solving techniques using flowchart, algorithm/pseudo code to solve the given problem.
3. Design and Implement C program using Control Statements and Functions.
4. Design and Implement C program using Pointers and File operations.
5. Identify the need for embedded C in real-time applications.

UNIT	Content
UNIT 1:-PROGRAMMING LANGUAGES AND PROBLEM SOLVING TECHNIQUES	Introduction – Fundamentals of digital computers - Programming languages -Programming Paradigms – Types of Programming Languages – Language Translators – Problem Solving Techniques: Algorithm – Flow Chart - Pseudo code. (11 Hours)

UNIT 2:- FUNDAMENTALS OF C	Evolution of C -Why C language - Applications of C language - Data Types in C –Operators and Expressions – Input and Output statements in C – Decision Statements – Loop Control Statements(12 Hours)
UNIT 3:- FUNCTIONS ,ARRAYS AND STRINGS	Functions – Storage Class – Arrays – Strings and standard functions - Pre-processor Statements. (11 Hours)
UNIT 4:- POINTERS, STRUCTURES AND UNION	Pointers – Dynamic Memory allocation – Structure and Union – Files. (11 Hours)

TEXT BOOKS:-

- 1.Jeyapooan T, “Fundamentals of Computing and Programming in C”, Vikas Publishing house, 2015.
- 2.Mark Siegesmund, "Embedded C Programming", first edition, Elsevier publications, 2014.

REFERENCE BOOKS:-

1. Ashok Kamthane, “Computer Programming”, Pearson Education, 7th Edition, Inc 2017.
2. Yashavant Kanetkar, “Let us C”, 15th edition, BPP publication, 2016.

Title: DATA STRUCTURE**Type: Core****Credits: 03**

Total Marks-80	Course Code: N1CS4	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30	45

COURSE OUTCOME:

Upon completion of this course, the students will be able to:

1. Understand the fundamental concepts of Data Structures and their applications.
2. Develop problem-solving skills using Data Structures.
3. Implement Data Structures using C programming language.

UNIT	Content
UNIT1:	Introduction and Overview: Definition, Classification and Operations of Data Structures. Algorithms: Complexity, Time-Space Tradeoff. Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Representation of Two Dimensional Arrays in Memory Operations on Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, and Insertion Sort. Two-Dimensional Arrays (12 Hours)
UNIT2:	Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists, Traversing, Inserting, Deleting and Searching in Singly Linked List, Doubly Linked List and Circular Linked List. Applications of Linked Lists: Addition of Polynomials. Hashing and Collision: Hashing, Hash Tables, Types of Hash Functions, Collision, Collision Resolution with Open Addressing and Chaining. (11 Hours)

UNIT3:	<p>Stacks: Definition, Representation of Stacks using Arrays and Linked List, Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression.</p> <p>Recursion: Definition, Recursive Notation, Runtime Stack, Applications of Recursion: Factorial of Number, GCD, Fibonacci Series and Towers of Hanoi.</p> <p>Queues: Definition, Representation of Queues using Array and Linked List, Types of Queue: Simple Queue, Circular Queue, Double-Ended queue, Priority Queue, Operations on Simple Queues and Circular Queues using Array and Linked List, Applications of Queues. (12 Hours)</p>
UNIT4	<p>Graphs: Definition, Terminology, Representation, Traversal.</p> <p>Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting, Deleting and Searching in Binary Search Tree, Height Balanced Trees: AVL Trees, Insertion and Deletion in AVL Tree. (10 Hours)</p>

TEXT BOOKS:-

1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023.
2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill, 2011.
3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications, 2022.

REFERENCE BOOKS:-

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.

Title: Hardware and Networking-LAB**Type: SEC/LAB****Credits: 02**

Total Marks-50	Course Code: N1CS5	(Total Number of Periods) Hrs
External Marks :25	Internal Marks:25	60

NOTE:

The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).

COURSE OUTCOME:

Upon completion of this course, the students will be able to

1. Implement the fundamental concepts of Data Analytics and work with MS Excel. Infer various data visualization tool.
2. Demonstrate various Data driven technique and perform predictive analysis.
3. Perform various advanced data analysis like Cognos Analytics.
4. Create and execute several Forecasting methods using Excel.

LIST OF PROGRAMS:**NOTE:**

- The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).
1. To Assemble a Desktop Computer: Assemble hardware components into a desktop unit.
 2. To Install an Operating System: Install Windows or Linux onto a computer system.
 3. To Set Up Device Drivers: Configure and install drivers for hardware components.

4. To Configure BIOS/UEFI Settings: Adjust settings in BIOS/UEFI firmware.
5. To Partition and Format Disks: Divide and format hard drives for data storage.
6. To Configure Basic Network Settings: Set up IP addresses and network configurations.
7. Network Simulation: a) Use network simulation tools (e.g., Cisco Packet Tracer) to design and simulate network topologies. b) Configure routers and switches in a simulated environment.
8. Performance Measurement: a) Measure network performance using tools like `ping`, `tracert`, and `iperf`. b) Analyze network traffic using Wireshark.
9. Implement VLANs: a) Configure VLANs on a switch and verify using simulation tools.
10. Set Up a Simple Web Server: a) Deploy a basic web server and configure HTTP/HTTPS access.
11. Network Security Lab: a) Implement basic firewall rules and VPN configurations. b) Perform vulnerability scanning and analyze results.
12. Network Troubleshooting: a) Diagnose and resolve common network issues. b) Use troubleshooting commands and techniques to fix connectivity problems.

Title: C PROGRAMMING - LAB

Type: SEC/LAB

Credits: 02

Total Marks-50		Course Code: N1CS6	(Total Number of Periods) Hrs
External Marks :25	Internal Marks:25		60

NOTE:

- The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).

LIST OF PROGRAMS:

1. Drawing Flowcharts using E- Chart & Writing pseudo code for the following problems

- (i) Greatest of three numbers
- (ii) Sum of N numbers
- (iii) Computation of nCr

2. Fundamentals of C

- (i) Program to illustrate arithmetic and logical operators
- (ii) Program to read and print data of different types
- (iii) Program to calculate area and volume of various geometrical shapes
- (iv) Program to compute biggest of three numbers

3. Function, Arrays and Strings

- (i) Program to compute Factorial, Fibonacci series and sum of n numbers using recursion
- (ii) Program to compute sum and average of N Numbers stored in an array
- (iii) Program to sort the given n numbers stored in an array
- (iv) Program to search for the given element in an array

4. Pointers, Structures and Union

- (i) Program to compute sum of integers stored in a 1-D array using pointers and dynamic memory allocation
- (ii) Program to read and print records of a student/payroll database using structures
- (iii) Program to simulate file copy
- (iv) Program to illustrate sequential access file

Title: DATA STRUCTURE - LAB**Type: SEC/LAB****Credits: 02**

Total Marks-50		Course Code: N1CS7	(Total Number of Periods) Hrs
External Marks :25	Internal Marks:25		60

NOTE:

- The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).

LIST OF PRACTICALS :

1. Implementing basic operations on arrays: insertion, deletion, searching.
2. Implementing linked lists: singly linked list, doubly linked list.
3. Implementing stack and queue using arrays and linked lists.
4. Implementing tree traversal algorithms: preorder, inorder, postorder.
5. Implementing binary search trees (BST) and operations: insertion, deletion, searching.
6. Implementing sorting algorithms: selection sort, bubble sort, insertion sort.
7. Implementing searching algorithms: linear search, binary search.
8. Implementing graph representation: adjacency matrix, adjacency list.
9. Implementing graph traversal algorithms: depth-first search (DFS), breadth-first search (BFS).
10. Implementing shortest path algorithms: Dijkstra's algorithm, Bellman-Ford algorithm.

Title: INDIAN KNOWLEDGE SYSTEM**Type: IKS****Credits: 02**

Total Marks-50		Course Code: N1CS8	(Total Number of Periods) Hrs
External Marks :	Internal Marks:50		30

COURSE OBJECTIVES:

1. To sensitize the students about context in which they are embedded i.e. Indian culture and civilisation including its Knowledge System and Tradition.
2. To help student to understand the knowledge, art and creative practices, skills and values in ancient Indian system.
3. To help to study the enriched scientific Indian heritage.
4. To introduce the contribution from Ancient Indian system & tradition to modern science & Technology

DETAILED CONTENTS:**Module 1: Introduction to IKS**

(Any Ten of total sessions assigned for Literary activity)

Introductory lecture on the any TEN topics below:

1. Indian Knowledge System
2. Indian Culture & Civilization
3. Ancient Indian Chemistry

4. Ancient Indian Metallurgy
5. Ancient Indian Mathematics
6. Ancient Indian Astronomy
7. Indian Astronomical Instruments
8. Indian Knowledge System (Upveda: Ayurveda)
9. Indian Knowledge System (Upveda: Gandharveda)
10. Indian Knowledge System (Vedangas: Shiksha, Kalpa, Vyakrana)
11. Indian Knowledge System (Vedangas: Jyotisha, Nirukta, Chandas)
12. Indian Architecture I: Sthapatya-Veda
13. Indian Architecture II: Temples
14. Indian Architecture III: Town & Planning
15. Indian Philosophical System

Module 2: Introduction to Creative Practices

(Twenty Lectures with at least Five different topics of total session under Creative activity)

Introductory lecture on the topics below:

1. Dhatuvada: art of metallurgy
2. Akara jnana: art of mineralogy
3. Vastuvidya: art of engineering
4. Yantramatrika: art of mechanics
5. Takshana: art of carpentry
6. Chalitikayoga: art of practicing as a builder of shrines
7. Raupyaratnapariksha: art of testing silver and jewels
8. Maniraga jnana: art of tinging jewels
9. Sucivayakarma: art of needleworks and weaving
10. Vadya vidya: art of playing on musical instruments
11. Geet vidya : art of singing
12. Nritya vidya: art of dancing
13. Natya vidya: art of theatricals
14. Alekhya vidya: art of painting
15. Viseshakacchedya vidya: art of painting the face and body with color
16. Udakavadya: art of playing on music in water
17. Manasi kavyakriya: art of composing verse
18. Bhushanayojana: art of applying or setting ornaments
19. Citrasakapupabhakshyavikarakriya: art of preparing varieties of delicious food
20. Dasanavasanangaraga: art of applying preparations for cleansing the teeth, cloths and painting the body
21. Utsadana: art of healing or cleaning a person with perfumes
22. Vastragopana: art of concealment of cloths
23. Balakakridanaka: art of using children's toys
24. Tandulakusumabalivikara: art of preparing offerings from rice and flowers
25. Pushpastarana: art of making a covering of flowers for a bed

REFERENCE BOOKS:

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru
2. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
3. The Cultural Heritage of India. Vol.I. Kolkata:Ramakrishna Mission Publication, 1972.
4. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
5. Dr. R. C. Majumdar, H. C. Raychaudhuri and Kalinkar Datta: An Advanced History of India (Second Edition) published by Macmillan & Co., Limited, London, 1953.
6. Rao, N. 1970. The Four Values in Indian Philosophy and Culture. Mysore: University of Mysore.
7. Avari, B. 2016. India: The Ancient Past: A History of the Indian Subcontinent from c. 7000 BCE to CE 1200. London: Routledge.

Title: ENVIRONMENTAL SCIENCE**Type: VAC****Credits: 02**

Total Marks-50		Course Code: N1CS9	(Total Number of Periods) Hrs
College Level Theory	Internal Marks:50		30

COURSE OUTCOME:

1. Explore the basic environmental concepts and issues relevant to the business and management field.
2. Recognize the interdependence between environmental processes and socio-economic dynamics.
3. Determine the role of business decisions, policies, and actions in minimizing environmental degradation.
4. Identify possible solutions to curb environmental problems caused by managerial actions.
5. Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

UNIT	Content
Unit 1: Understanding Environment, Natural Resources, and Sustainability	Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. (8 Hours)
Unit 2: Ecosystems, Biodiversity, and Sustainable Practices	Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management. (7 Hours)
Unit 3: Environmental Pollution and Waste Management	Various types of environmental pollution, including air, water, noise, soil, and marine pollution, and their impacts on businesses and communities. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management; Natural and man-made disasters, their management, and the role of businesses in mitigating disaster impacts. (7 Hours)
Unit 4: Social Issues, Legislation, and Practical Applications	Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption. Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India. (8 Hours)

READINGS:**Text Books (Latest Editions):**

- Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
- Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
- Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.

- Miller, G.T. & Spoolman S. Living in the Environment. (20th ed.). Cengage.
 - Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
 - Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
 - Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
 - Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed.). Pearson.
- References

Title: MOOCS/SWYAM/NEPTEL/GOEC BASKET COURSES

Type: OE-I

Credits: 01

Total Marks-50		Course Code: N1CS10	(Total Number of Periods) Hrs
College Assessment	Internal Marks:50		30 Hrs of Engagement

Note:

As part of the academic curriculum, students are required to complete **Open Elective (OE)** courses in addition to the core subjects.

Note that the OE must be selected from Faculty wise basket other than faculty of core subject, allowing you the opportunity to explore interdisciplinary topics and broaden your knowledge.

- **MOOCs/NEPTEL:** You can choose relevant courses from platforms like Coursera, edX, or NPTEL that are pre-approved by the university. Ensure that the course content aligns with the credit requirements and is recognized by the academic guidelines.
- **GOEC Basket:** Alternatively, you may choose an OE from the university's available electives, as listed in the GOEC basket.

The completed OE must be submitted for credit within the prescribed time frame as outlined by the university.

For any further details or guidance on selecting appropriate courses, consult the academic coordinator.

SEMESTER II**Title: COMMUNICATION SKILLS****Type: AEC****Credits: 02**

Total Marks-50		Course Code: N2CS1	(Total Number of Periods) Hrs
Theory Exam Marks :30	Internal Marks:20		30

COURSE OUTCOME:

At end of the course students would be able to

1. Understand the paragraph, prose, poetry and communication skills .
2. Formulate/ compose his own sentences and able to speak English Language.
3. Collaborate with others students in English.
4. Communicate properly their ideas and concepts in English.

Unit	Content
Unit 1:	1) Question Tags 2) Synonyms and Antonyms 3) Prefixes, Suffixes, Zero Suffix and Infix (6 Hours)
Unit 2:	1) Making Requests and Responding to Requests 2) Thanking Someone and Responding to Thanks 3) Developing a Thoughts (6 Hours)
Unit 3:	1) On the Rule of the Road – A.G. Gardiner 2) A Simple Philosophy – Seathl 3) The Thief – Ruskin Bond (6 Hours)
Unit 4:	1) The World is Too Much With Us – William Wordsworth 2) Love’s Philosophy – P.B.Shelley 3) Success is Counted Sweetest – Emily Dickinson (6 Hours)

Skill Enhancement Module:

- 1) Blog Writing 2) Presentation on a topic from prescribed prose/poem **(6 Hours)**

TEXT BOOKS:-

A Textbook for College Students [ISBN 989354421778] Edited by Board of Editors, Sant Gadge Baba Amravati University, Amravati Publisher : Orient BlackSwan Pvt Ltd

Title: Computer Organisation and Architecture**Type: Core****Credits: 03**

Total Marks-80		Course Code: N2CS2	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30		45

COURSE OUTCOME:

Upon completion of this course, the students will be able to :

1. To Understand the basics of Digital Electronics and Binary Number System
2. To Learn the implementation of Combinational Circuit
3. To Learn the implementation of Sequential Circuit
4. To Understand the Organization of basic computers
5. To Understand the concept of Parallel Processing
6. To understand the concept of memory organization.

Unit	Content
UNIT-I	Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture, Boolean Laws and Theorems, K-Map: Truth Tables to K-Map, 2, 3 and 4 variable K Map, K-Map Simplifications, Don't Care Conditions, SOP and POS. Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, ASCII, EBCDIC, Excess3 Code, The Gray Code. (11 Hours)
UNIT-II	Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, Demultiplexer Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop. Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load Binary Counters-4 bit synchronous and Asynchronous binary counter. (11 Hours)
UNIT-III	Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input/Output Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator logic. Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC), RISC Vs CISC. (11 Hours)
UNIT-IV	Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor(IOP). Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware. (12 Hours)

TEXT BOOKS:-

1. Donald P Leach, Albert Paul Malvino, Goutam Saha- "Digital Principles & Applications" , Tata McGraw Hill Education Private Limited,2011Edition.
2. M. Morris Mano- "Computer System Architecture", Pearson/Phi, Third Edition

REFERENCE BOOKS:-

- 1 William Stallings- "Computer Organization and Architecture", Pearson/PHI, Sixth Edition,
- 2 Andrew S. Tanenbaum- "Structured Computer Organization", PHI /Pearson 4th Edition,
- 3 M.V .Subramanyam, "Switching Theory and Logic Design", Laxmi Publications (P) Ltd.
- 4 Ikvinderpal Singh, Computer Organization Architecture, Khanna Book Publishing

Title: DATABASE MANAGEMENT SYSTEM**Type: Core****Credits: 03**

Total Marks-80		Course Code: N2CS3	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30		45

COURSE OUTCOME:

Upon completion of this course, the students will be able to :

1. Create a normalized database for an organization.
2. Implement and test database queries for any real time data bases.
3. Formulate and design forms and reports for database applications.
4. Apply transactional management and concurrency control for a database transaction.
5. Recognize the features of client server architecture, distributed architecture, directory system and network types

Unit	Content
UNIT I: Introduction to Databases and Data Models	<p>Introduction to Databases: Data, Database, and DBMS; Database Applications; Advantages and Disadvantages of DBMS; Roles of Database Users and Administrators.</p> <p>Data Models: Overview of Data Models; Types of Data Models (Hierarchical, Network, Relational, Object-Oriented); Importance of Data Models in DBMS.</p> <p>Database Design & Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Composite Key, Alternate Key, Unique Key, Surrogate Key; Constraints (Primary Key, Foreign Key, Unique, NOT NULL, CHECK); Introduction to ER Models and Diagrams; Key Constraints and Weak Entity Sets; Extended ER Features.</p> <p>Relational Model: Overview of Relational Model and Relational Schema. (11 Hours)</p>
UNIT II: Relational Algebra, SQL, and Normalization	<p>Relational Algebra and Calculus: Relational Algebra Operations (Selection, Projection, Set Operations, Joins, Division); Tuple and Domain Relational Calculus.</p> <p>Structured Query Language (SQL): DDL and DML; Aggregate Functions (Min, Max, Sum, Avg, Count); Logical Operators (AND, OR, NOT); Predicates (Like, Between, Alias, Distinct); SQL Clauses (Group By, Having, Order By, Top/Limit); Joins (Inner, Natural, Outer, Equi Join).</p> <p>Advanced SQL: Analytical, Hierarchical, and Recursive Queries; Views, Cursors, Stored Procedures, Functions, Packages, Triggers, Dynamic SQL.</p> <p>Normalization and Database Design: Functional Dependencies; Armstrong's Axioms, Normal Forms (1NF, 2NF, 3NF, BCNF); Denormalization. (12 Hours)</p>
UNIT III: Transaction Management and Database Storage	<p>Transaction Management: ACID Properties; Transactions and Schedules; Lock-Based Concurrency Control; Deadlock Management; Transaction Support in SQL; 2PL, Serializability, and Recoverability.</p> <p>Database Storage and Indexing: File Organizations and Indexing; Index Structures and Performance Tuning; Guidelines for Index Selection. (11 Hours)</p>
UNIT IV: NoSQL, Big Data, and Database Security	<p>NoSQL Databases and Big Data: Introduction to NoSQL; Data Models (Document, Key-Value, Column Family, Graph); CAP Theorem, BASE vs ACID; CRUD Operations, MongoDB Operators; Big Data Technologies: Hadoop, MongoDB, Cassandra.</p> <p>Database Security and Advanced Topics: Access Control, Discretionary Access Control; Data Warehousing, OLAP, and Data Mining. (11 Hours)</p>

TEXT BOOKS:-

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", third edition, McGraw – Hill, 2018
2. Benjamin Rosenzweig, Elena Rakhimov, "Oracle PL/SQL by Example", fifth edition, Prentice Hall, 2015
3. Brad Dayley, "NoSQL with MongoDB in 24 Hours", 1st edition, Sams Publishing, 2024
4. Silberschatz, H.F. Korth and S. Sudharshan, "Database System Concepts" , Fifth Edition, Tata McGraw Hill, New Delhi, 2006.

REFERENCE BOOKS:-

- 1 J. D. Ullman, "Principles of Database Systems", Galgotia Publishers, Second Edition, New Delhi, 1988
- 2 C.J. Date, An Introduction to Database Systems, Third Edition, Narosa, New Delhi, 1985
- 3 G. V. Post, "Database Management Systems Designing and Building Business Application" ,McGraw Hill International edition, 1999
- 4 R.P. Mahapatra, Govind Verma, "Database Management Systems", Khanna Publishing House, 2025.

Title: OBJECT ORIENTED PROGRAMMING THROUGH JAVA**Type: Core****Credits: 03**

Total Marks-80		Course Code: N2CS4	(Total Number of Periods) Hrs
Theory Exam Marks :50	Internal Marks:30		45

COURSE OUTCOME:

1. To introduce the object oriented programming system concepts
2. To introduce syntax and semantics of Java programming language
3. To develop modular programs using Java
4. To setup JDK environment to create, debug and run Java programs

Unit	Content
UNIT I:	<p>Fundamentals of Object-Oriented Programming: Basic Concepts of Object-Oriented Programming (OOP), Benefits and Applications of OOP.</p> <p>Java Evolution: Java Features, Difference between Java, C and C++, Java and Internet, Java Environment.</p> <p>Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program and JVM, Command Line Arguments. (11 Hours)</p>
UNIT II:	<p>Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting.</p> <p>Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity. Decision Making, Branching & Looping: Decision Making with Control Statements, Looping statements, Jump in loops, Labelled loops. (12 Hours)</p>
UNIT III:	<p>Classes, Objects and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance</p> <p>Arrays, Strings and Vectors: 1D arrays, Creating an Array, 2D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types</p>

	Inheritance: Defining, extending classes, and Implementing Interfaces. Multipleinheritance and polymorphism. (11 Hours)
UNIT IV:	Packages: Basics of packages, System packages, Creating and accessing packages, Creating user defined packages, Adding class to a package. Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions. (11 Hours)

TEXT BOOKS:

1. Balaguruswamy E. (2023). Programming with JAVA: A Primer. 7th edition. India: McGraw Hill Education
2. Schildt, H. (2022). Java: The Complete Reference. 12th edition. McGraw-Hill Education.

REFERENCE BOOKS:

1. Arunesh Goyal, The Essentials of JAVA, Khanna Book Publishing Company Private Limited, 2012.
2. Tanweer Alam, Core JAVA, Khanna Book Publishing Company Private Limited, 2015.
3. Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson, 2008.
4. S. Malhotra and S. Choudhary, Programming in Java, 2nd Edition, Oxford University Press, 2014.

Title: DATABASE MANAGEMENT SYSTEM – LAB**Type: SEC/LAB****Credits: 02**

Total Marks-50		Course Code: N2CS5	(Total Number of Periods) Hrs
External Marks :25	Internal Marks:25		60

NOTE:

The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).

LIST OF PROGRAMS:

- 1) To study Basic SQL commands (create table, use, drop, insert) and execute the following queries using these commands:
 - Create a table 'Emp' with attributes 'ename', 'ecity', 'salary', 'enumber', 'eaddress', 'deptname'.
 - Create another table 'Company' with attributes 'cname', 'ccity', 'empnumber' in the database 'Employee'.
- 2) To study the viewing commands (select, update) and execute the following queries using these commands:
 - Find the names of all employees who live in Delhi.
 - Increase the salary of all employees by Rs. 5,000.
 - Find the company names where the number of employees is greater than 10,000.
 - Change the Company City to Gurgaon where the Company name is 'TCS'.
- 3) To study the commands to modify the structure of table (alter, delete) and execute the following queries using these commands:
 - Add an attribute named 'Designation' to the table 'Emp'.
 - Modify the table 'Emp', Change the datatype of 'salary' attribute to float.
 - Drop the attribute 'deptname' from the table 'emp'.
 - Delete the entries from the table 'Company' where the number of employees are less than 500.

- 4) To study the commands that involve compound conditions (and, or, in , not in, between , not between , like , not like) and execute the following queries using these commands:
 - Find the names of all employees who live in 'Gurgaon' and whose salary is between Rs.20,000 and Rs. 30,000.
 - Find the names of all employees whose names begin with either letter 'A' or 'B'.
 - Find the company names where the company city is 'Delhi' and the number of employees is not between 5000 and 10,000.
 - Find the names of all companies that do not end with letter 'A'.
- 5) To study the aggregate functions (sum, count, max, min, average) and execute the following queries using these commands:
 - Find the sum and average of salaries of all employees in computer science department.
 - Find the number of all employees who live in Delhi.
 - Find the maximum and the minimum salary in the HR department.
- 6) To study the grouping commands (group by, order by) and execute the following queries using these commands:
 - List all employee names in descending order.
 - Find number of employees in each department where number of employees is greater than 5.
 - List all the department names where average salary of a department is Rs.10,000.
- 7) To study the commands involving data constraints and execute the following queries using these commands:
 - Alter table 'Emp' and make 'enumber' as the primary key.
 - Alter table 'Company' and add the foreign key constraint.
 - Add a check constraint in the table 'Emp' such that salary has the value between 0 and Rs.1,00,000
 - Alter table 'Company' and add unique constraint to column cname
 - Add a default constraint to column ccity of table company with the value 'Delhi'
- 8) To study the commands for joins (cross join, inner join, outer join) and execute the following queries using these commands:
 - Retrieve the complete record of an employee and its company from both the table using joins.
 - List all the employees working in the company 'TCS'.
- 9) To study the various set operations and execute the following queries using these commands:
 - List the enumber of all employees who live in Delhi and whose company is in Gurgaon or if both conditions are true.
 - List the enumber of all employees who live in Delhi but whose company is not in Gurgaon.
- 10) To study the various scalar functions and string functions (power, square, substring, reverse, upper, lower, concatenation) and execute the following queries using these commands:
 - Reverse the names of all employees.
 - Change the names of company cities to uppercase.
 - Concatenate name and city of the employee.
- 11) To study the commands involving indexes and execute the following queries:
 - Create an index with attribute ename on the table employee.
 - Create a composite index with attributes cname and ccity on table company.
 - Drop all indexes created on table company.
- 12) To study the conditional controls and case statement in PL-SQL and execute the following queries:
 - Calculate the average salary from table 'Emp' and print increase the salary if the average salary is less than 10,000.

- Display the deptno from the employee table using the case statement if the deptname is 'Technical' then deptno is 1, if the deptname is 'HR' then the deptno is 2 else deptno is 3.
- 13) To study procedures and triggers in PL-SQL and execute the following queries:
- Create a procedure on table employee to display the details of employee to display the details of employees by providing them value of salaries during execution.
 - Create a trigger on table company for deletion where the whole table is displayed when delete operation is performed.
- 14) Consider the tables given below. The primary keys are made bold and the data types are specified.
- PERSON(**driver_id**:string , name:string , address:string)
 CAR(**regno**:string , model:string , year:int)
 ACCIDENT(**report_number**:int , **accd_date**:date , location:string)
 OWNS(**driver_id**:string , **regno**:string)
 PARTICIPATED(**driver_id**:string , **regno**:string , **report_number**:int ,**damage_amount**:int)
- Create the above tables by properly specifying the primary keys and foreign keys.
 - Enter at least five tuples for each relation.
 - Demonstrate how you
 - Update the damage amount for the car with specific regno in the accident with report number 12 to 25000.
 - Find the total number of people who owned cars that were involved in accidents in the year 2008.
 - Find the number of accidents in which cars belonging to a specific model were involved.

Title: JAVA PROGRAMMING – LAB

Type: SEC/LAB

Credits: 02

Total Marks-50		Course Code: N2CS6	(Total Number of Periods) Hrs
External Marks :25	Internal Marks:25		60

NOTE:

The list suggests the program set. Hence, the concerned staff may modify the list as needed (minimum 15).

1. Write a Java program to print "Hello, World!" to the console.
2. Create a program to take user input for their name and age, then print a personalized greeting message.
3. Write a program to calculate and print the area of a rectangle given its length and width.
4. Implement a program that checks if a given number is even or odd and prints the result.
5. Create a Java program to generate a multiplication table for a given number.
6. Define a class representing a Car with attributes like make, model, and year. Create objects of this class and print their details.
7. Write a program to demonstrate method overloading by creating multiple methods with the same name but different parameters to calculate the area of a shape (e.g., rectangle, circle).
8. Create a class representing a BankAccount with methods to deposit, withdraw, and check balance. Instantiate objects of this class and perform transactions.
9. Implement a program to illustrate method overriding by creating a superclass Animal and subclasses like Dog and Cat with a common method sound().
10. Design a class representing a Student with attributes like name, roll number, and marks. Write methods to calculate the total and average marks of students.
11. Define an interface named Shape with methods to calculate area and perimeter. Implement this interface in classes like Circle and Rectangle.
12. Create a package named "math" and define classes for basic mathematical operations like addition, subtraction, multiplication, and division.
13. Design an interface named Vehicle with methods to start(), stop(), and accelerate(). Implement this interface in classes like Car and Bicycle.
14. Implement a package named "utilities" containing classes for string manipulation operations like reversing a string and checking for palindrome.

Title: DESIGN THINKING AND INNOVATION**Type: SEC****Credits: 02**

Total Marks-50		Course Code: N2CS7	(Total Number of Periods) Hrs
Theory Exam Marks :30	Internal Marks:20		30

COURSE OUTCOME:

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

1. Propose real-time innovative product designs and Choose appropriate frameworks, strategies, techniques during prototype development.
2. Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype development.
3. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products.

CONTENTS:**Unit 1: Basics of Design Thinking**

1. **Introduction to Innovation:** Understand the concept of innovation and its significance in business.
2. **Creative Thinking & Problem Solving:** Explore creative thinking processes and problem-solving approaches.
3. **Design Thinking Approach:** Learn the Design Thinking approach and its objectives.
4. **Design Thinking & Customer Centricity:**
 - o Real-world examples of customer challenges.
 - o Use of Design Thinking to enhance customer experience.
 - o Parameters of product experience.
 - o Aligning customer expectations with product offerings.
5. **Global Success Stories:** Discuss global success stories of companies like AirBnB, Apple, IDEO, and Netflix.
6. **Four Stages of Design Thinking Process:**
 - o Empathize
 - o Define
 - o Ideate
 - o Prototype
 - o Implement

Unit 2: Learning to Empathize and Define the Problem

1. **Empathy in Innovation:** Understand the importance of empathy in the innovation process and learn how students can develop empathy using design tools.
2. **Observing and Assimilating Information:** Techniques for observing and gathering information for problem-solving.
3. **Individual Differences & Uniqueness:** Group discussions and activities to encourage understanding, acceptance, and appreciation of individual differences.
4. **Wicked Problems:**
 - o What are wicked problems?
 - o Identifying wicked problems around us and understanding their potential impact through solutions.

Unit 3: Ideate, Prototype, and Implement

1. **Ideation Templates:** Learn various ideation templates, including brainstorming and systems thinking.
2. **Brainstorming:** Understanding the concept of brainstorming and how to reach consensus on wicked problems.

3. **Customer Experience Mapping for Ideation:** Learn methods for mapping customer experience during the ideation phase.
4. **Prototyping:**
 - o Know the methods of prototyping.
 - o Understand the purpose of rapid prototyping.
5. **Implementation:** Steps for implementing design solutions.

Unit 4: Feedback, Re-Design, & Re-Create

1. **Feedback Loop:** Understanding the feedback loop, focusing on user experience, addressing ergonomic challenges, and creating user-focused designs.
2. **Final Concept Testing:** Conduct final testing of the concept with end-users.
3. **Final Presentation:** Solve problems through innovative design concepts and creative solutions, culminating in a final presentation.

TEXT BOOKS:

- 1) **E. Balaguruswamy** (2023), *Developing Thinking Skills (The Way to Success)*, Khanna Book Publishing Company.
- 2) **Tim Brown** (2008), *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*, Harvard Business Review.
- 3) **R.T. Krishnan & V. Dabholkar**, *8 Steps to Innovation*, Collins Publishing.

REFERENCE BOOKS:

1. **Nigel Cross**, *Design Thinking*, Bloomsbury.

Title: CYBER SECURITY ETHICS

Type: VAC

Credits: 02

Total Marks-50		Course Code: N2CS8	(Total Number of Periods) Hrs
College level theory	Internal Marks:50		30

COURSE OUTCOME:

Upon completion of this course, the students should be able to:

1. Understand the ethical values and principles underlying cyber activities.
2. understand the historical development and current governance structures of the Internet.
3. Evaluate the complexities of free speech and content control issues in cyberspace.
4. Examine the legal and moral dimensions of intellectual property in the digital realm.

Unit	Content
Units I: The Internet and Ethical Values	Cyber ethics and the “Law of the Horse”, Iron Cage or Gateway to Utopia? Ethical Values and the Digital Frontier, Utilitarianism, Contract Rights (Contractarianism), Moral Duty (Pluralism), New Natural Law, Postscript on Moral Theory, Floridi’s Macro-ethics , Normative Principles: Autonomy, Nonmaleficence, Beneficence, Justice (7 Hours)
Unit II: Regulating and Governing the Internet	A Short History of the Internet, The Internet’s Current Architecture, The World Wide Web, Electronic Commerce, Gatekeepers and Search Engines, Social Networking, Social Problems and Social Costs: The Invisible Hand, Regulating the Net: The Visible Hand, A “Bottom-Up” Approach: The Power of Code,

	Internet Governance, Contested Sovereignty in Cyberspace (8 Hours)
Unit III: Free Speech and Content Controls in Cyberspace	Speech and Internet Architecture, Pornography in Cyberspace: Public Policy Overview, Automating Content Controls, New Censors and Controversies. Hate Speech and Online Threats, Anonymous Speech, The Ethics of Blogging, Spam as Commercial Free Speech, Government Censorship and the Fate of Political Speech (7 Hours)
Unit IV: Intellectual Property in Cyberspace	Background on Intellectual Property What Is Intellectual Property? Legal Protection for Intellectual Property, Moral Justifications for Intellectual Property, Recent Legislation. Issues for the Internet and Networking Technologies: Copyright and the Digital Dilemma, Software Ownership and the Open-Source Code Movement, Digital Rights Architectures, Business Method Patents in Cyberspace, Patents and Smartphones, Domain Names and Interconnectivity Issues. (8 Hours)

TEXT BOOK:

1. "CYBERETHICS Morality and Law in Cyberspace" by Richard A. Spinello.

REFERENCE:

1. "Ethics in Information Technology" by George Reynolds
2. "Digital Ethics: Rethinking Responsibility in Technology" by Jessica Powell

Title: MOOCS/SWYAM/NEPTEL/GOEC BASKET COURSES**Type: OE-II****Credits: 01**

Total Marks-50		Course Code: N2DA9		(Total Number of Periods) Hrs	
College Assessment		Internal Marks:50		30 Hrs of Engagement	

Note:

As part of the academic curriculum, students are required to complete **Open Elective (OE)** courses in addition to the core subjects.

Note that the OE must be selected from Faculty wise basket other than faculty of core subject, allowing you the opportunity to explore interdisciplinary topics and broaden your knowledge.

- **MOOCs/NEPTEL:** You can choose relevant courses from platforms like Coursera, edX, or NPTEL that are pre-approved by the university. Ensure that the course content aligns with the credit requirements and is recognized by the academic guidelines.
- **GOEC Basket:** Alternatively, you may choose an OE from the university's available electives, as listed in the GOEC basket.

The completed OE must be submitted for credit within the prescribed time frame as outlined by the university.

For any further details or guidance on selecting appropriate courses, consult the academic coordinator.