SCHEME OF INSTRUCTION
Programme: Bachelor of Computer Applications
First Year Bachelor of Computer Applications Semester—I

Sr. No.	Course Category	Course Name	Course Code	Teaching Scheme (hrs.)			Total Credits	% weightage			ESE Duration (hrs.)	TOTAL
				L	T	P		CT	CA	ESE		
1.	DSC	Mathematics Foundations to Computer Science – I	BCA11101	3	-	-	3	30	10	60	3	100
2.	SEC	Problem Solving Techniques	BCA11102	3	-	-	3	30	10	60	3	100
3.	SEC	Problem Solving Techniques Lab	BCA11103	-	-	4	2	-	25	25	2	50
4.	DSC	Computer Architecture	BCA11104	3	-	-	3	30	10	60	3	100
5.	DSC	Computer Architecture Lab	BCA11105	-	-	4	2	-	25	25	2	50
6.	MDE	Indian Science and Technology (Past, Present and Future)	BCA11106	2	-	-	2	14	6	30	2	50
7.	VAC	Environmental Science and Sustainability	BBA11105	2	-	-	2	14	6	30	2	50
8.	AEC	Digital Wellness & Basic Communication Lab	BSH41104	-	-	4	2	-	25	25	2	50
9.	AEC	Liberal Learning Courses I - Lab	BSH41X01	-	-	4	2	-	25	25	2	50
				13	0	12	21	118	142	340	21	600

Course Category	DSC	SEC	AEC	MDE	VAC
Credits	8	5	4	2	2
Cumulative Summary	8	5	4	2	2

TOTAL CREDITS: 21

				17/05/2025	1.0
Chairman	Dean	Vice Principal	Principal	Date of BoS	Version

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11101: Mathematics Foundations to Computer Science – I	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
			Total	100 Marks

Course Objectives:

1.	To familiarize students with sets, relations, functions, and their properties.
2.	To enable students to apply counting principles and solve recurrence relations
3.	To equip students to understand and analyze graphs, trees, and their applications
4.	To develop proficiency in matrix operations and solving linear algebraic equations

Course Contents

Unit I	**Set, Relation and Function:** Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products. Relations on a Set, Properties of Relations, Representing Relations using matrices and digraphs, Types of Relations, Equivalence Relation, Equivalence relation and partition on set, Closures of Relations, Warshall's algorithm. Functions, properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to-one) and bijective functions, inverse of functions. Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.
Unit II	**Counting and Recurrence Relation:** Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem. Recurrence relations, modelling recurrence relations with examples, like Fibonacci numbers, the tower of Hanoi problem. Solving linear recurrence relation with constant coefficients using characteristic equation roots method.
Unit III	**Elementary Graph Theory:** Basic terminologies of graphs, connected and disconnected graphs, subgraph, paths and cycles, complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs. Trees, properties of trees, concept of spanning tree. Planar graphs. Definitions and basic results on the topics mentioned.
Unit IV	**Matrix Algebra:** Types of matrices, algebra of matrices–addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix, inverse of a matrix, applications of matrices to solve system of linear equations, Eigen values and Eigen vectors, Caley Hamilton theorem.

Text Books	
T.1	Garg, Reena. Engineering Mathematics, Khanna Book Publishing Company, 2024.
T.2	Kolman, B., Busby, R., and Ross, S. Discrete Mathematical Structures (6th Edition), Pearson Education, 2015.
Reference Books	
R.1	Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education, 2007.
R.2	Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
Useful Links	
1	https://www.youtube.com/watch?v=UWOVipHUZaM
2	https://www.coursera.org/learn/mathematics-for-computer-science

	Course Outcomes	CL	Class Sessions
BCA11101.1	Explain sets, relations, functions, and their properties.	2	10
BCA11101.2	Apply counting principles and solve recurrence relations.	3	10
BCA11101.3	Analyze graphs, trees, and their fundamental properties.	4	10
BCA11101.4	Evaluate matrix operations and solve linear equation systems.	5	10

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11102: Problem Solving Techniques	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
			Total	100 Marks

Course Objectives:

1.	To introduce C programming fundamentals, structure, and basic control statements.
2.	To teach arrays, strings, pointers, and dynamic memory management concepts.
3.	To familiarize students with structures, unions, and file handling techniques.
4.	To develop skills in graphics programming and standard library usage.

Course Contents

Unit I	**Introduction to programming:** Need for programming languages, history of C, structure of a C program, life cycle of a C program, C character set, keywords, identifiers, variables, data types, constants, basic input/output statements, operators in C, operator precedence and expressions, decision-making statements, looping statements, **Functions:** function declaration and definition, parameter passing Techniques, scope of variables, recursion.
Unit II	**Arrays, strings, and pointers:** one-dimensional arrays and array manipulation, basic sorting and searching algorithms, strings and string handling functions, pointer basics including declaration, initialization, and arithmetic, dynamic memory allocation using malloc, calloc, realloc, and free.
Unit III	**Structures, unions, and file handling:** structure definition, declaration, and initialization, unions, file handling, handling text and binary files, file handling functions, file opening modes, preprocessor and directives, macros.
Unit IV	**Graphics Programming and Standard Library:** Graphics Programming in C, graphics libraries, initializing graphics mode, drawing shapes and text, and simple animation. **Standard Library:** essential header files, input/output functions, common string and math functions, dynamic memory management, and basic error handling. Industry Practices focus on code documentation, modular programming, and basic debugging techniques.

Text Books

T.1	Programming for Problem-Solving with C by Dr. Kamaldeep
T.2	Computer Fundamentals and Programming in C by Reema Thareja

Reference Books

R.1	Expert C Programming: Deep Secrets by Peter van der Linden
R.2	Brian W. Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Pearson, 2015.
Useful Links	
1	https://archive.nptel.ac.in/courses/106/105/106105171/
2	https://www.coursera.org/specializations/c-programming

	Course Outcomes	CL	Class Sessions
BCA11102.1	Explain C program structure, data types, and control statements.	2	10
BCA11102.2	Implement arrays, strings, pointers, and dynamic memory allocation.	3	10
BCA11102.3	Demonstrate structures, unions, and file handling operations in C.	3	10
BCA11102.4	Develop simple graphics and utilize standard library functions effectively.	3	10

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11103: Problem Solving Techniques Lab	Examination Scheme	
Practical	4 Hrs./Week		CT-I	-
Tutorial	-		CT-II	-
Total Credits	2		CA	25 Marks
Duration of ESE: 2 Hrs.			ESE	25 Marks
			Total	50 Marks

Course Objectives:

1.	To introduce fundamental C programming concepts and syntax through practice.
2.	To enable application of control structures and functions in programming.
3.	To develop skills in arrays, pointers, structures, and file operations.
4.	To foster ability to create graphics and modular programs in C.

Sr. No.	List of Practical
1	Write and execute a program to display basic data types.
2	Implement decision-making and looping constructs in a C program.
3	Develop functions demonstrating parameter passing and recursion.
4	Apply sorting and searching algorithms on one-dimensional arrays.
5	Manipulate strings using standard string handling functions.
6	Demonstrate pointer arithmetic and dynamic memory allocation.
7	Construct and use structures and unions in a program.
8	Implement file operations for reading and writing text files.
9	Create simple graphics to draw shapes and display text.
10	Debug and document a modular C program using standard libraries.

Text Books

T.1	Problem Solving and Program Design in C, Jeri R. Hanly, Elliot B. Koffman

T.2	C Programming and Problem Solving, KDP Publications
Reference Books	
R.1	PROBLEM SOLVING WITH C, M.T. Somashekara
R.2	Programming for Problem-solving with C, BPB Publications
Useful Links	
1	https://archive.nptel.ac.in/courses/106/105/106105171/
2	https://youtu.be/87SH2Cn0s9A

	Course Outcomes	CL	Class Session
BCA11103.1	Explain basic C programming concepts and syntax with examples.	2	6
BCA11103.2	Implement control structures and functions to solve programming problems.	3	6
BCA11103.3	Develop programs using arrays, pointers, structures, and file handling.	3	6
BCA11103.4	Create simple graphics and modular programs using standard libraries.	3	6

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11104: Computer Architecture	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
			Total	100 Marks

Course Objectives:

1.	To introduce the fundamental principles and concepts of computer architecture.
2.	To explain digital logic, data representation, and basic computer components.
3.	To describe CPU design, instruction execution, and addressing modes.
4.	To illustrate memory hierarchy, pipelining, and I/O organization in modern systems.

Course Contents

Unit I	**Digital Logic and Data Representation:** Digital signals and logic gates, Boolean algebra and simplification, Karnaugh Maps (2-4 variables), SOP and POS forms, Number systems (decimal, binary, octal, hexadecimal) and conversions, Binary arithmetic, BCD arithmetic, Error detection codes (parity, Hamming), ASCII and Gray codes, Introduction to floating-point representation.
Unit II	**Combinational and Sequential Circuits, Basic Computer Concepts:** Combinational circuits: adders, subtractors, multiplexers, decoders, encoders, Sequential circuits: flip-flops (SR, D, JK), Registers and shift registers, Synchronous and asynchronous counters, State machines (basic overview), Von Neumann architecture, Basic computer operation, Performance metrics (CPI, speedup), Introduction to instruction set architecture.
Unit III	**CPU Design and Instruction Execution:** Computer organization vs. architecture, Register transfer language and micro-operations, Instruction cycle and formats, Addressing modes, Stack and general register organization, Data transfer and manipulation, Program control, RISC vs. CISC architectures, Assembly language basics, Introduction to pipelining and pipeline hazards.
Unit IV	**Advanced Processing, Memory, and I/O Systems:** Pipelining concepts and hazard mitigation, Memory hierarchy (cache, main memory, virtual memory), Cache mapping and replacement policies, Memory management (paging), I/O organization: interfaces, interrupts, DMA, Modern interconnection standards (USB, SATA), Introduction to parallel processing and GPUs.

Text Books

T.1	Computer System Architecture by M. Morris Mano

T.2	Digital Design and Computer Architecture, David Money Harris, Sarah L. Harris, 2nd Edition, Morgan Kaufmann
Reference Books	
R.1	Computer Architecture: A Quantitative Approach, John L. Hennessy, David A. Patterson, 6th Edition, Morgan Kaufmann
R.2	Computer Organization and Design: The Hardware/Software Interface by David A. Patterson & John L. Hennessy
Useful Links	
1	https://www.youtube.com/watch?v=ziMRjDlLEwo
2	https://www.coursera.org/learn/comparch

	Course Outcomes	CL	Class Session
BCA11104.1	Explain digital logic, number systems, and data representation techniques.	2	10
BCA11104.2	Design combinational and sequential circuits for basic computer operations.	3	10
BCA11104.3	Analyze CPU organization, instruction execution, and addressing modes.	4	10
BCA11104.4	Evaluate memory hierarchy, pipelining, and modern I/O systems.	5	10

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11105: Computer Architecture Lab	Examination Scheme	
Practical	4 Hrs./Week		**CT-I**	-
Tutorial	-		**CT-II**	-
Total Credits	**2**		**CA**	25 Marks
Duration of ESE: 2 Hrs.			**ESE**	25 Marks
			Total	**50 Marks**

Course Objectives:

1.	To introduce digital logic, data representation, and basic computer components
2.	To develop practical skills in CPU operation, assembly programming, and DOS commands
3.	To explore memory organization, pipelining, and cache management techniques.
4.	To familiarize students with virtualization, system configuration, and I/O management.

Sr. No.	List of Practical
1	Design and simulate basic logic circuits (AND, OR, NOT, XOR) using a digital logic simulator.
2	Assemble and boot a desktop computer system, identifying all components.
3	Simulate register transfer operations using a CPU simulator.
4	Perform basic DOS commands for file and directory management (e.g., DIR, COPY, DEL, REN, MD, CD) and observe their effects on the file system.
5	Write and execute simple assembly language programs to perform arithmetic operations.
6	Profile and compare execution time of code on RISC and CISC processor simulators.
7	Implement a basic instruction pipeline simulation and observe effects of hazards using educational software.
8	Simulate cache memory mapping techniques using a cache simulator.
9	Write and execute a batch file in DOS to automate a sequence of system tasks (e.g., backup files, organize directories, display system information).
10	Deploy and test a basic virtual machine using virtualization software (VirtualBox, VMware) and analyse resource allocation.

Text Books

T.1	Digital Design and Computer Architecture, David Harris, Sarah Harris

T.2	William Stallings, Computer Organization and Architecture: Designing for Performance, Pearson.
Reference Books	
R.1	Computer Architecture: A Quantitative Approach, John L. Hennessy, David A. Patterson
R.2	Structured Computer Organization, Andrew S. Tanenbaum
Useful Links	
1	https://www.youtube.com/playlist?list=PLw6vmiIQrilTWa5twNV8opVJ3ge_kEfsM
2	https://cce.iith.ac.in/events/next-gen-computer-architecture-cse-2025.html

	Course Outcomes	CL	Class sessions
BCA11105.1	Apply digital logic and CPU simulation tools for circuit analysis.	3	6
BCA11105.2	Analyze processor performance using pipelining, cache, and memory simulators.	4	6
BCA11105.3	Execute DOS commands and batch files for system management tasks.	3	6
BCA11105.4	Evaluate system configurations using virtualization and assembly programming.	5	6

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BCA11106: Indian Science and Technology (Past, Present and Future)	Examination Scheme	
Lecture	2 Hrs./Week		CT-I	07 Marks
Tutorial	-		CT-II	07 Marks
Total Credits	2		CA	06 Marks
Duration of ESE: 2 Hrs.			ESE	30 Marks
			Total	50 Marks

Course Objectives:

1.	To introduce students to traditional Indian scientific knowledge and practices.
2.	To explore the evolution of Indian agriculture, medicine, and technology.
3.	To develop understanding of ancient Indian contributions to science and society.
4.	To encourage critical thinking about the relevance of traditional knowledge today.

Course Contents

Unit I	**Indian Traditional Knowledge - Science and Practices**: Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & coevolution. Traditional agricultural practices, Traditional water-harvesting practices, Traditional Livestock and veterinary Sciences Traditional Houses & villages, Traditional Forecasting, Traditional Ayurveda & plant based medicine, Traditional writing Technology
Unit II	**Agriculture in India**: krishisuktas, Krishiparashara, Brihatsamhita, Types of crops, Manures, Types of land- devamatruka, nadimatruka, use of animals in warfare, animal husbandry, Animals for medicines. Ancient transport in India
Unit III	**Ancient Indian Science** (Textile, Agriculture, Transport): Textile Technology in India: Cotton (natural cellulose fiber), silk, wool (natural protein fibers), bast and leaf fibers, mridhudhautadhupitambaram (meaning a practice of fumigating the fabric with incense smoke before use as a part of the finishing process), sitadhautavasanayugala (bleached white–a finishing process); suchhastah, sutradharah (needle and thread – tools for stitching). dyeing, washing spinning and weaving technology
Unit IV	**Ancient Indian Science** (Ayurveda & Yoga) Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha bhuta, the communication between body & mind, health regimen for wellbeing, introduction to yoga (raja yoga, astang yoga, gyan yoga), understanding of Indian psychological concept, consciousness, tridosha & triguna.

Text Books

T.1	History of Science, Technology, Environment, and Medicine in India, Suvobrata Sarkar, Routledge, 2023
T.2	Aspects of Science and Technology in Ancient India, Arupjyoti Saikia and S. Sahay, Routledge,

	2023
Reference Books	
R.1	Science and Technology in Ancient Indian Texts, Bal Ram Singh, Girish Nath Jha, Umesh Kumar Singh, and Diwakar Mishra, DK Printworld, 2012
R.2	A Brief History of Science & Technology in India (From Earliest Times to 18th Century), Dr. Pardeep Lathwal 2021
Useful Links	
1	https://www.indiascienceandtechnology.gov.in/
2	https://onlinecourses.nptel.ac.in/noc22_hs128/preview

	Course Outcomes	CL	Class sessions
BCA11106.1	Recall key traditional Indian scientific practices and technologies.	1	7
BCA11106.2	Explain principles behind ancient Indian agriculture and medicine.	2	7
BCA11106.3	Apply traditional techniques to analyze current technological challenges.	3	7
BCA11106.4	Analyze evolution of Indian science from past to present.	4	7

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Program: Bachelor of Computer Application Semester – I

Teaching Scheme		BBA11105: Environmental Science and Sustainability	Examination Scheme	
Lecture	2 Hrs./Week		CT-I	07 Marks
Tutorial	-		CT-II	07 Marks
Total Credits	2		CA	06 Marks
Duration of ESE: 2 Hrs.			ESE	30 Marks
			Total	50 Marks

Course Objectives:

1.	To introduce fundamental environmental concepts and sustainability principles.
2.	To develop understanding of ecosystems, biodiversity, and conservation methods.
3.	To examine causes, impacts, and management of environmental pollution.
4.	To familiarize students with environmental legislation and sustainable development strategies.

Course Contents

Unit I	**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.
Unit II	**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.
Unit III	**Environmental Pollution, Waste Management, and Sustainable Development**: 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. Importance of adopting cleaner technologies; Solid waste management; Natural and man-made disasters
Unit IV	**Legislation, and Practical Applications**: 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; human population growth.

Text Books	
T.1	Introduction to Environmental Sciences and Sustainability, Emily P. Harris, UWF's Library Pressbook, 2023
T.2	Text Book on Environmental Science and Sustainability, Evincepub Publishing
Reference Books	
R.1	Encyclopedia of Biodiversity, Simon A. Levin
R.2	Sustainability Principles and Practice, Margaret Robertson
Useful Links	
1	https://www.coursera.org/browse/physical-science-and-engineering/environmental-science-and-sustainability
2	https://iisdt.in/product/certificate-in-sustainability-science/

	Course Outcomes	CL	Class sessions
BCA11107.1	Explain environmental concepts, natural resources, and sustainability issues.	2	7
BCA11107.2	Apply ecosystem and biodiversity knowledge to sustainable practices.	3	7
BCA11107.3	Analyze causes and impacts of pollution and waste management.	4	7
BCA11107.4	Evaluate environmental legislation and strategies for sustainable development.	5	7