SAMARTH EDUCATIONAL TRUST

ARVIND GAVALI COLLEGE OF ENGINEERING, SATARA

(AN AUTONOMOUS INSTITUTE)

Curriculum for First Year B.C.A.

List of Abbreviations

Sr. No.	Abbreviation	Description	Code
1	L	Lecture	
2	T	Tutorial	
3	P	Practical	
4	Cr	Credits	
5	CC	Core Courses	
6	AEC	Ability Enhancement Courses	
7	MDE	Multi-Disciplinary Elective Courses	
8	VAC	Value Added Courses	
9	SEC	Skill Enhancement Courses	
10	DSE	Discipline Specific Courses	
11	OE	Open Elective	

SAMARTH EDUCATIONAL TRUST
ARVIND GAVALI COLLEGE OF ENGINEERING
ENGINEERING (B.Tech & M.Tech) BCA MCA B.VOC
NAAC & NBA Accredited AN AUTONOMOUS INSTITUTE ISO 9001:2015
Approved by AICTE, New Delhi, Recognised by Govt. Of Maha.,DTE Mumbai & Affiliated to
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BCA 6545, MCA 6545, B.Voc 6545

Ref No.: Date :

As per NEP Guidelines, Proposed Scheme of Credit Distribution
First Year BCA-2025-26
SEMESTER I

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	CC	25BCA1101	Mathematics Foundations to Computer Science- I	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
2	SEC	25BCA1102	Problem Solving Techniques	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
3	CC	25BCA1103	Computer Architecture	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
4	AEC	25BCA1104	General English I	1	1	--	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
5	MDE	25BCA1105	Indian Knowledge System-Indian Culture and Civilization	2	--	--	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
6	VAC	25BCA1106	Environmental Science and Sustainability	2	--	--	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
7	AEC	25BCA1107	Additional Course-Indian or Foreign Language Other than Mother Tongue and English	1	1	--	2	AU	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	SEC	25BCA1102L	Problem Solving Techniques Laboratory	--	--	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
9	CC	25BCA1103L	Computer Architecture Laboratory	--	--	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
			Total	**15**	**2**	**8**	**25**	**19**		**850**		
Total Contact Hours –25 Total Credits – 19												

As per NEP Guidelines, Proposed Scheme of Credit Distribution
First Year BCA-2025-26
SEMESTER II

Sr. No.	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme			
				L	T	P	Hrs./ Week	Cr	Components	Max	Min for Passing	
1	CC	25BCA1201	Mathematics Foundations to Computer Science- II	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
2	CC	25BCA1202	Data Structures	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
3	CC	25BCA1203	Operating Systems	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
4	SEC	25BCA1204	Object Oriented Programming using Java	3	--	--	3	3	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
5	SEC	25BCA1205	Web Technologies	2	--	--	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
6	VAC	25BCA1206	Indian Constitution	2	--	--	2	2	CA1	10		40
									MSE	30		
									CA2	10		
									ESE	50	20	
7	AEC	25BCA1207	Additional Course - Indian or Foreign Language Other than Mother Tongue and English	1	1	--	2	AU	CA1	25		20
									MSE	--		
									CA2	25		
									ESE	--	--	
8	CC	25BCA1202L	Data Structure Laboratory	--	--	2	2	1	CA1	25		20
									CA2	25		
									POE	--	--	
9	SEC	25BCA1204L	Object Oriented Programming using Java Laboratory	--	--	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
10	SEC	25BCA1205L	Web Technologies Laboratory	--	--	4	4	2	CA1	25		40
									CA2	25		
									POE	50	20	
			Total	**17**	**1**	**10**	**28**	**21**		**850**		
Total Contact Hours –28 Total Credits – 21												

Title of the Course: Mathematics Foundations to Computer Science I Course Code: 25BCA1101	L	T	P	Credit
	3	-	--	3

Course Prerequisite:

1. Basic understanding of mathematics at 10+2 level Familiar with algebraic expressions, basic functions, and sets, Logical reasoning and problem-solving skills.
2. Familiarity with mathematical logic (AND/OR/NOT operations).
3. Understanding of elementary probability concepts.

Course Description:

This course provides foundational mathematical tools for computer science applications. Topics include set theory, relations, matrices, graph theory, and numerical techniques. It equips students with problem-solving abilities essential for programming, data structures, algorithms, and analytical reasoning.

Course Objectives:

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

1. Learn basic terminology formal logic, proofs, sets, relations, functions and perform the operations associated with same.
2. Use formal logic proof and logical reasoning to solve problems.
3. To understand significance of statistical measures.
4. To study Correlation and Probability.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Relate and apply techniques for constructing mathematical proofs and make use of appropriate set operations, propositional logic to solve problems
CO2	Use function or relation models to interpret associated relationships
CO3	Apply basic counting techniques and use principles of probability
CO4	Given a data, compute various statistical measures of central tendency
CO5	Use appropriate Sampling techniques

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2	3	3								1
CO3	3		3	3	2			2				1
CO4	3	2	3	3								1
CO5	3	2	3	3	3			2				1

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Set Theory** Set Concept, Methods of representing sets, Set Operations, Types of Set, Properties of Set, cardinality of a Set, Principle of Inclusion and Exclusion, Proof by using Venn diagram, Properties of Union Operation, Intersection of Sets, Properties of Intersection Operation, Relative Complement of a Set, Cartesian Products	**8**
2	**Relations and Functions** Relation: Definitions of Relation, Types of Relation, Closure of Relations, Warshall's algorithm Functions: Define Function, Domain and Range, Types function, Composite function, Inverse of a function, Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.	**8**
3	**Matrix** Definition, General Form, Representation of matrix, Types of matrices, Operations on matrices, transpose, row /column transformations, Determinant, Rank of Matrices, Inverse of the matrix by Co-factor and Adjoint method, solutions to three variable problems by using matrices, application problems of matrices, Eigen values and Eigen vectors	**8**

4	**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.	**8**
5	**Numerical Methods:** Concept and importance of errors in numerical methods. Solution of algebraic and transcendental equations: Bisection method and Newton-Raphson methods. Numerical Interpolation: Newton's Forward and Newton's Backward interpolation formula and Lagrange's formula. Numerical Integration: Trapezoidal rule and Simpson's 1/3 rule.	**8**

Text Books:

Sr. No.	Title	Author	Publisher
1	Engineering Mathematics-I	G. V. Kumbhojkar	C. Jamnadas & Co
2	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers, Delhi
3	A Text Book of Applied Mathematics Vol. I	P. N. Wartikar & J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune
4	Numerical Methods in Engineering and science	B. S. Agrewal	Khanna Publishers

Reference Books:

Sr. No.	Title	Author	Publisher
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons
2	Advanced Engineering Mathematics	H. K. Dass	S. Chand & Company Pvt. Ltd, New Delhi
3	Higher Engineering Mathematics	B. S. Grewal	Laxmi Publications (P) Ltd., New Delhi
4	Numerical Methods	M. K. Jain, S.R, Kiyengar, R.K. Jain	New age International Lmt.
5	Discrete Mathematics & its Application with Combinatorics & Graph Theory	Kennet. H. Rosen	McGraw Hill Education Pvt. Ltd.

Title of the Course: Problem Solving Techniques Course Code: 25BCA1102	L	T	P	Credit
	3	-	-	3

Course Prerequisite: A basic understanding of programming concepts such as variables, data types, control structures (if-else, loops), and functions.

Course Description:
This course introduces the basics of problem-solving and algorithm development using the C programming language. It covers programming logic, control structures, data representation, arrays, strings, functions, recursion, and debugging. Students will learn to break down problems, design efficient algorithms, and implement them in C, developing a strong foundation in computational thinking and programming.

Course Objectives:
By the end of this course, the students will be able to:
1. To develop the ability to break down complex problems into smaller, manageable components.
2. To learn how to design algorithms to solve a given problem.
3. To understand how to structure your program using functions to improve clarity and reusability.
4. To understand and apply various control structures (if-else, loops, switch-case, etc.) to manipulate the flow of a program.
5. To understand and apply recursive techniques to solve problems.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand basic terminology of computers, problem solving, programming Languages and their evolution.
CO2	Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement).
CO3	Explain use of appropriate data types, control statements.
CO4	Translate an algorithm into a C computer program.
CO5	Testing and analyzing programs using debugging tools.

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3	3	3	2	3							3
CO3	3	2										
CO4	3	3	3	3	2							2
CO5	3	3			3					1		2

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA 1	10
MSE	30
CA 2	10
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.
MSE is based on 50% of course content.
ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Fundamentals of Problem Solving and Algorithm Design** Problem concepts, classification, analysis Problem-solving steps (Understand, Plan, Execute, Review) Breaking problems into sub problems Input/output specifications and validation Pre and post conditions Algorithm development, characteristics, analysis (efficiency, correctness) Standard algorithm format Pseudocode and flowcharts Role of data structures in problem solving	**8**

2	**Programming Logic and Control Structures** Introduction to programming languages Different generations of programming languages Typed vs type less programming languages History of C language Empty C program Data types in C Operators in C C basics: input/output (scanf, printf), assignment, increment/decrement, **Translating pseudo code to C** Structured programming: sequence, selection (if, if-else, else-if, switch) repetition (for, while, do-while), break and continue statements. Types of repetition: Entry controlled, Exit controlled, Counter controlled, Definite, Indefinite and Sentinel controlled Iteration problems: Patterns, Fibonacci	**8**
3	**Problems on Repetition and Data Representation** Number problems: digit extraction, palindrome, prime, perfect, amicable, Armstrong, factorial, Sequence statistics (max, min, sum, average) using sentinel-controlled loops Data representation in memory: o Integers: signed magnitude, 1's complement, 2's complement o Floating point: IEEE 754 format o Characters: ASCII, UNICODE	**8**
4	**Arrays, Strings** Arrays: One dimensional, Two dimensional Problems on Array: Problems on Arrays: reading and writing of array elements, reading and writing of Array Elements in reverse order, Finding maximum, minimum, sum, average, Matrix Operations. String and String functions.	**8**
5	**Modular Programming, Functions, Recursion, and Debugging** Modular programming concepts: top-down approach and bottom-up approach, Functions: Definition, Declaration, Call, Function types based on arguments and return values, Role of return statement Recursion, Operator precedence and associativity. Debugging basics and Debugging techniques and tools.	**8**

Text Books:

Sr. No.	Title	Author	Publisher
1	Introduction to algorithms	Cormen, Leiserson, Rivest, Stein	MIT Press
2	Programming in ANSI C	E. Balagurusamy	McGraw Hill Education
3	The C Programming Language	Brian W. Kernighan, Dennis M. Ritchie	Person Educacion
4	Practical C Programming for Problem Solving,	Nagaraju Y	Khanna Book Publishing Company

Reference Books:			
Sr. No.	**Title**	**Author**	**Publisher**
1	The C Programming Language	Brian W. Kernighan and Dennis Ritchie,	Pearson
2	Problem Solving and Program Design in C	Jeri Hanly and Elliot Koffman	Pearson
3	Let Us C	Y S Kanetkar	BPB Publications
4	C How to Program	Harvey Deitel and Paul Deitel	Pearson India
5	Programming for Problem Solving	H. K. Dass	Khanna Book

Title of the Course: Computer Architecture Course Code: 25BCA1103	L	T	P	Credit
	3	-	-	3

Course Prerequisite:

1. Digital Logic Design (Boolean algebra, gates, circuits).
2. Programming in C/Assembly (pointers, memory, low-level operations).
3. Basic Data Representation (Binary, hex, floating-point).
4. Discrete Math (Number systems, logic).

Course Description:

Computer Organization & Architecture covers the design and functionality of computer systems, including CPU structure, memory hierarchy, I/O systems, and performance optimization, bridging hardware and software concepts.

Course Objectives:

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

1. To study number system, logic gates.
2. To understand combinational and sequential circuits.
3. To provide a broad overview of architecture and functioning of computer systems.
4. To learn the basic concepts behind the architecture and organization of computers.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Design of combinational circuit.
CO2	Design of sequential circuits.
CO3	Describe block diagram of CPU, Memory and types of I/O transfer.
CO4	Understand fundamental computer structure.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1
CO2	3	3			2							1
CO3	3	3	1		2							1
CO4	3	3										1

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.
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ESE is based on 100% course content with 60-70% weightage for course content covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Data representation and Computer Arithmetic** Review of Decimal, Binary, Octal, Hexadecimal Number systems and their inter-conversion, BCD code, Gray code, Excess-3 code, ASCII , EBCDIC, Unicode, Signed and Unsigned numbers, 1's and 2's complements, Binary arithmetic.	**8**
2	**Boolean Algebra & Logic Gate**:- Boolean theorems, Boolean Laws, De Morgan's Theorem, Reduction of Logic expression using Boolean Algebra, Introduction to Logic (AND, OR, NOT), Classification of Logic gates, Universal Logic gates, Implementation of other gates using universal gates. Basic concepts of Karnaugh map, minterm and maxterm.	**8**
3	**Combinational Circuits: -**Definition of combinational circuits, Detail study of Half adder, Full adder, Half subtractor, Full subtractor, Multiplexer (4:1) & Demultiplexer (1:4), Encoder (8-line-to- 3-line) and Decoder (3-line-to-8-line), Parity generator and checker, Block diagram of ALU.	**8**
4	**Sequential circuit** Definition of sequential circuits, Detail study of Flip Flops and truth tables: S-R FF, J K FF, T and D type FFs, Flip flop as memory device.	**8**

5	**CPU, Memory and I/O Organization** Block diagram of CPU, functions of CPU, general register organization, flags, Concept of RISC and CISC Memory System hierarchy, Cache Memory, Internal Memory, External Memory, Concept of Virtual Memory. Basics of I/O organization: types of I/O data transfers	**8**

Text Books:

Sr. No.	Title	Author	Publisher
1	Modern Digital Electronics	R.P. Jain	R.P. Jain
2	Computer System Architecture	Morris Mano	Morris Mano

Reference Books:

Sr.No.	Title	Author	Publisher
1	Structured Computer Organization	Dattu R Joshi	Pearson
2	Digital Design and Computer Architecture	Sarah Harris, David Harris	Pearson

Title of the Course: General English-I Course Code: 25BCA1104	L	T	P	Credit
	1	1	-	2

Course Prerequisite: Basic understanding of English (reading/writing simple sentences).

Course Description:
This course strengthens foundational English skills—Listening, Speaking, Reading, and Writing (LSRW)—for academic and everyday communication. It focuses on grammar, vocabulary, comprehension, and practical language use.

Course Objectives:
By the end of this course, the students will be able to:
1. To provide learning environment to practice listening, speaking, reading and writing skills.
2. To assist the students to carry on the tasks and activities through guided instructions and materials.
3. To effectively integrate English language learning with employability skills and training.
4. To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Develop the ability to comprehend spoken English in various contexts (conversations, lectures, Presentations).
CO2	Participate in group discussions, presentations, and short speeches with confidence.
CO3	Develop skills in descriptive, narrative, and expository writing.
CO4	Apply basic grammar rules accurately in speaking and writing.
CO5	Enhance interpersonal communication for academic and professional settings

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					2				1	3		3
CO2					2			2	1	3		3
CO3					2			2		3		2
CO4					3			3		3		2
CO5					2	2		1	1	3		3

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA 1	10
MSE	30
CA 2	10
ESE	50

CA1 and **CA2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.
MSE is based on 50% of course content (first three units).
ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Contents

Unit No.	Unit Title and Contents	Hours
1	**Communication Theory** Communication basics: Importance, process, levels, Forms/methods: verbal and non- verbal, Barriers and solutions, Flow/channels of business communication (Internal, External, Vertical, Horizontal, Diagonal, And Grapevine), Problems and Solutions.	**7**
2	**Enhancing Language Learning Skills (LSRWT)** **Effective listening**: Process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers **Effective speaking**: Importance, Telephonic Conversation, various oral business contexts/situations, group communication, Preparing effective public communications **Effective reading**: Important types, overcoming common obstacles, tips and strategies **Effective Writing**: Mastering English Essentials and Fundamentals, paragraph and essay writing techniques, diary/blog writing Art of précis writing, Techniques to comprehend and summarize a given technical, scientific, or industry-oriented text **Thinking** as a learning skill	**7**
3	**Employment Skills** Covering letter and resume, Group Discussion, Interviews (Online / Offline) Introduction to soft skills (Etiquettes, Team Work, Empathy, Problem Solving etc.)	**6**

4	**Formal Business Correspondence** Principles, structure (elements), Layout (complete block, modified block, semiblock), Types (enquiry and replies, claim and adjustment)	**6**

Text Books:

Sr. No.	Title	Author	Publisher
1	Developing Communication Skills	Krishna Mohan Meera Banerji	Macmillan Publishers India Ltd.
2	Communication Skills for Engineers and Scientists	Sangeeta Sharma Binod Mishra	PHI Learning Private Limited.

Reference Books:

Sr. No.	Title	Author	Publisher
1	Professional Communication Skills	Er. A.K.Jain, Dr.Pravin S.R.Bhatia, Dr.A.M.Shaikh	S.Chand
2	Personality Development and Soft skills	Barun K.Mitra	Oxford University Press
3	Communication Skills for Engineers	Sunita Mishra C.Muralikrishna	Pearson Education
4	Effective Technical Communication	M.Ashraf Rizvi	McGraw Hill Education Pvt.Ltd.

Title of the Course: Indian Knowledge System Course Code: 25BCA1105	L	T	P	Credit
	2	-	-	2

Course Prerequisite: Student should have eager to learn the rich heritage of traditional Indian knowledge across disciplines such as philosophy, sciences, arts, literature, and more.

Course Description:
It explores India's rich intellectual traditions in areas like philosophy, science, medicine (Ayurveda), mathematics, architecture, governance, and arts. The course aims to promote cultural awareness, holistic thinking, and sustainable practices by connecting ancient Indian wisdom with modern applications. Open to students of all streams, it fosters appreciation of India's heritage and its relevance today

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

1. To sensitize the students about context in which they are embedded i.e. Indian Culture and civilization 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.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Describe the principles and philosophies of Vedic and Non-Vedic Indian Knowledge Systems
CO2	Explain ancient scientific and technological concepts in mathematics and computation.
CO3	Apply traditional mathematical and astronomical methods to solve basic problems.
CO4	Relate Indian science, technology, and arts to modern applications.
CO5	Use IKS concepts in health, wellness, ethics, and governance for holistic growth.

CO – PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1		2	2	1	2		1	2
CO2	3	2	3	3		1	2	1	2		1	2
CO3	3	2	3	3		1	2	1	2		2	2
CO4	3	2	3	2		2	3	1	2		2	3
CO5	3	2	3	2		3	3	2	3		2	3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Content:

Unit No.	Title and Contents	Hours
1	**Introduction to IKS** Caturdaśa Vidyāsthānam, 74 Kalas**,** Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy (Sāṃkhya and Yoga, Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta), NonVedic schools of Philosophical Systems (Cārvāka, Buddhist, Jain), Puranas (Maha-puranas, Upa-Puranas and Sthala-Puranas), Itihasa (Ramayana, Mahabharata), Niti Sastras, Subhasita	**5**
2	**Foundation concept for Science & Technology** Linguistics & Phonetics in Sanskrit (panini's), Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach to physical reality, constituents of the physical reality, Pramāṇa, Saṃśaya	**5**

3	**Indian Mathematics & Astronomy in IKS** Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of pi, Trigonometry, Algebra, Chandah Sastra of Pingala, Indian Astronomy, celestial coordinate system, Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System Astronomical Instruments (Yantras) Jantar Mantar or Raja Jai Singh Sawal.	**5**
4	**Indian Science & Technology in IKS** Indian S & T Heritage, sixty-four art forms and occupational skills (74 Kalas) Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Town & Planning Architecture in India, Temple Architecture, Vastu Sastra	**5**
5	**Humanities & Social Sciences in IKS** Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System BodyMind Intellect- Consciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kauṭilyan State	**5**

Textbooks:

Sr. No	Title	Edition	Author/s
1	Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla	Second	Kapur K and Singh A. K
2	Religion and Society in Ancient India,	First	Om Prakash

References:

Sr. No	Title	Author	Publisher
1	History of Indian Philosophy	Second	Nira Konar

Title of the Course: Environmental Science and Sustainability Course Code: 25BCA1106	L	T	P	Credit
	2	-	-	2

Course Prerequisite:
The students will have the knowledge of basic **science knowledge,** basic understanding of electricity and magnetism and basic awareness of pollution types and causes

Course Description:
This course provides students with a comprehensive understanding of the interrelationship between the environment, society, and sustainable development. Aligned with the vision of NEP 2020, it adopts a multidisciplinary and holistic approach, integrating scientific, ethical, economic, and policy perspectives on environmental challenges. Students will explore fundamental concepts of ecology, biodiversity, natural resources, climate change, pollution, and waste management. Through project-based learning, fieldwork, and case studies, learners will engage in real-world environmental problem-solving, develop critical thinking skills, and foster environmental responsibility. The course also encourages active citizenship by integrating SDGs (Sustainable Development Goals) and promoting ecological literacy.

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

1. To **introduce** learners to the fundamental environmental concepts, sustainability principles, natural resources, and their relevance to business and society.
2. To **develop an understanding** of ecosystems, biodiversity, and ecological balance, emphasizing conservation and sustainable practices.
3. To **familiarize students** with different types of environmental pollution, waste management strategies, and their impact on human and business environments.
4. To **enable students** to understand environmental legislation, societal issues, and practical approaches to sustainable development and ethical responsibility.

Course Outcomes:

CO	After the completion of the course the students should be able to:
CO1	**Explain** the core concepts of environment, sustainability, and natural resource management, along with their significance in societal and business contexts.
CO2	**Analyze** ecosystem functions and biodiversity conservation strategies, and **evaluate** the role of India as a mega-diverse nation.
CO3	**Identify and assess** types and causes of pollution, and **apply** principles of waste management and disaster mitigation in real-world scenarios.
CO4	**Evaluate** the effectiveness of environmental policies and laws, and **propose** sustainable practices and ethical responsibilities for businesses and individuals.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	P012
CO1	2	2	3	2	3	1	3		1	1	2	2
CO2	1	2	2	3	2	1	3		1	1	1	1
CO3	2	2	3	2	1	1	3		1	1	1	1
CO4					2	3	3	1	1	1	1	2

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA1	10
MSE	30
CA2	10
ESE	50

CA1 and **CA2** are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

MSE is based on 50% of course content (first three units).

ESE is based on 100% course content with 60-70% weightage for course content (last three units) covered after MSE.

Course Contents

Unit	Unit Title and Contents	Hours
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. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.	**06**

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. Strategies for in situ and ex situ conservation, nature reserves, and the significance of India as a mega diverse nation.	**06**
3	**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, 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	**06**
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	**07**

Text Books:			
Sr. No.	**Title**	**Author**	**Publisher**
1.	Non-Conventional Source of Energy	G. D Rai	Khanna, Publisher Delhi, 2006
2.	Environment and Ecology	Dr. Anil Kumar Shankhwar	Uttarakhand Open University, Haldwani, Nainital, 2022
3.	Essentials of Ecology and Environmental Science.	Rana, S.V.S.	PHI Learning Pvt. Ltd., 2013
4.	Environment Science	Dr. Y. K Singh	New Age International (P) Ltd., Publishers, 2006
5.	Environmental Studies	Prof. Erach Bharucha	University Grants Commission, New Delhi. 2004
6.	Environmental Studies (3rd ed.)	Poonia, M. P	Khanna Book Publishing Co
7.	Textbook of Environmental Studies (3rd ed.)	Bharucha, E.	Orient Blackswan Private Ltd.
8.	Text Book of Environmental Studies.	Dave, D., & Katewa, S. S.	Cengage Learning India Pvt ltd
9.	Environmental studies: from crisisto cure (4th ed.).	Rajagopalan, R.	Oxford University Press.

Reference Books			
Sr.No.	**Title**	**Author**	**Publisher**
1.	Basics of Environmental Science	Allaby, M	Taylor & Francis e-Library, 2002.
2	Energy technology-Non conventional, renewable and conventional	Rao S. Parulekar B.B.	Khanna Publisher, New Delhi 2005
3	Energy and the environment	Robert A. Ristinen, Jack. Kraushaar, Jeffery Brack	Wiley publisher
4	Environment and ecology	Khanduri, I., Pandey M., Maikhuri R.	Transmedia publication Srinagar Garhwal, 2006

Title of the Course: Additional Course – Indian or Foreign Language. Course Code: 25BCA1107	L	T	P	Credit
	1	1	-	AU

Course Prerequisite: Desire to get acquainted with the Japanese language.

Course Description:
Japanese is a unique, context-driven language known for its politeness levels, minimal sounds, and deep cultural ties. It uses three scripts Hiragana for grammar, Katakana for foreign words, and Kanji for meaning—creating a blend of phonetic simplicity and written complexity. Its structure relies heavily on context, honorifics, and indirect expressions, reflecting Japan's social values and communication style.

Course Objectives:
By the end of this course, the students will be able to:
1. To meet the needs of ever-growing industry with respect to language support.
2. To get introduced to Japanese society and culture through language.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Read & Write Hiragana script at the level required to follow UG curriculum and JLPT level N5.1.
CO2	Read & Write Katakana script at the level required to follow UG curriculum and JLPT level N5.1.
CO3	Write & Speak basic sentences and questions related to self, family and friends.
CO4	Listen & comprehend and speak about time, hobbies, likes, dislikes and food preferences.
CO5	Write basic Kanjis.

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								2		3		2
CO2								2		3		2
CO3								3		3		3
CO4								2		3		2
CO5								3		3		3

Assessment Scheme:

Two components of Continuous Assessment (CA-1, CA-2) having 50% weightage each.

Assessment Component	Marks
CA1	25
MSE	--
CA2	25
ESE	--

CA1 and **CA2** are based on Assignment/ Declared test/ Quiz/Seminar/Group discussions presentation, etc.

Course Contents

Unit No.	Unit Title and Contents	Hours
1.	Introduction & History of Japanese Language. Self-Introduction. Greetings.	**03**
2.	Basic Numbers (1 to 100), Weekdays, Months.	**03**
3.	Days in month. How to express date & birthdate.	**03**
4.	Hiragana. Hiragana Song. Classroom Vocabulary.	**03**

Text Books:			
Sr.No.	**Title**	**Author**	**Publisher**
1	Minano Nihongo	Genki	Goyal

Title of the Course: Problem Solving Techniques Laboratory. Course Code: 25BCA1102L	L	T	P	Credit
	-	-	4	2

Course Pre-Requisite: Familiarity with fundamental programming concepts such as variables, data types, control structures (if-else, loops), and functions.

Course Description:

The Problem-Solving Techniques Lab is a hands-on course aimed at enhancing students' abilities to analyze and solve complex problems using computational methods. It focuses on developing algorithmic thinking and practical programming skills, primarily using languages like C. Students engage in exercises that involve designing, implementing, testing, and debugging solutions to various problems.

Course Objectives:

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

1. Understand basic terminology of computers, problem solving, programming Languages and their evolution.
2. Create specification from problem requirements by asking questions to disambiguate the requirement statement.
3. Design the solution from specification of a problem and write pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement).
4. Translate an algorithm into a C computer program.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Understand the fundamentals of programming concepts and problem-solving approaches using the C language.
CO2	Develop algorithms and flowcharts to solve computational problems efficiently.
CO3	Implement control structures, functions, and arrays to design modular programs in C.
CO4	Analyze and debug C programs to improve program correctness and performance.

CO-PO Mapping:

CO	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1			1						3
CO2	3	3	3		3			2				
CO3	3		3		3				3			
CO4	2	3		3		3		3				2

Assessment Scheme:
Two components of Continuous Assessment (CA-1, CA-2), End Semester Practical Oral Examination (POE), have 25%, 25% and 50% weightage, respectively.

Assessment Component	Marks
CA1	25
CA2	25
POE	50

CA1 and **CA2** are based on 50% practical assignment.
POE is based on 100% Experiments.

Course Contents:

Practical No.	Practical Title and Contents	Hours
1	**Experiment 1: Basic Input/Output and Simple Arithmetic** a. Write a C program to print Welcome message. b. Write a C program to input two numbers from user and perform arithmetic operations. c. Write a C program to convert temperature from degree celcius to farenheit and vice versa.	**02**

2	**Experiment 2: Loops** a. Given a positive integer value n. Write a C program to display number, square and cube of numbers from 1 to n in a tabular format. b. Given an input positive integer number, Write a c program to display odd numbers from in the range [1,n] using while loop. c. Write a C program to display the following patterns. $ 1 2 3 4 5 1 2 3 4 5 $ $ 1 2 3 4 1 2 3 4 $ $ $ 1 2 3 1 2 3 $ $ $ $ 1 2 1 2 $ $ $ $ $ 1 1 d. Write a program to display the first n terms of Fibonacci sequence using do while loop.	**04**
3	**Experiment 3: Decision Making** a. Write down c program to check if given positive integer number is a palindrome or not. b. Compute character grade from the marks (0<=marks<=100) of a subject. Grading Scheme: 80-100: A, 60-79:B, 50-59:C, 40-49:D, 0-39:F. Solve this using both else-if ladder and switch case. c. Write down a C program to check if a given positive integer number is a prime number or not.	**04**
4	**Experiment 4: Arrays** a. Write a C program to compute a maximum of 8 numbers. b. Write a C program to accept elements into the array and calculate the sum, average, maximum number and minimum number from array. c. Write a C program to perform matrix operations addition, subtraction and transpose.	**04**
5	**Experiment 5: Strings** a. Write a C program to implement your own string length and string reversal functions. Write a C program to check whether the string is palindrome or not.	**02**
6	**Experiment 6: Recursion** a. Write a C recursive program to count the number of digits of a positive integer number. b. Write a C recursive program to compute x^y using only multiplication. Write a C recursive program to calculate Factorial of a number.	**04**

Text Books:

Sr.No.	Title	Author	Publisher
1	Introduction to algorithms	Cormen, Leiserson, Rivest, Stein	MIT Press
2	The C Programming Language	Brian W. Kernighan, Dennis M. Ritchie	Person Educacion
3	Practical C Programming for Problem Solving,	Nagaraju Y	Khanna Book Publishing Company

References:

Sr.No.	Title	Author	Publisher
1	The C Programming Language	Brian W. Kernighan and Dennis Ritchie,	Pearson
2	Problem Solving and Program Design in C	Jeri Hanly and Elliot Koffman	Pearson
3	Let Us C	Y S Kanetkar	BPB Publications

Title of the Course: Computer Architecture Lab Course Code: 25BCA1103L	L	T	P	Credit
	-	-	4	2

Course Prerequisite: Programming Fundamentals: Understanding the basic syntax and semantics of C programming language. Problem-Solving Skills: Ability to break down a problem into smaller steps and devise a step-by-step solution and familiarity with simple algorithms

Course Description:
The course intends to train students to enhance experimental skills and apply fundamental chemical principles to solve chemistry related problems in engineering. The course providing experience to students about qualitative and quantitative analysis of different samples using instrumental and non-instrumental techniques.

Course Objectives:
By the end of this course, the students will be able to:
1. To study number system, logic gates
2. To understand combinational and sequential circuits
3. To provide a broad overview of architecture and functioning of computer systems
4. To learn the basic concepts behind the architecture and organization of computers.

Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	Design of combinational circuits
CO2	Design of sequential circuits
CO3	Describe block diagram of CPU, Memory and types of I/O transfer
CO4	Understand fundamental computer structure

CO-PO Mapping:

CO	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		3			2	2	3		1
CO2	3	3	3		3			2	2	2		1
CO3	3				3			1		2	1	
CO4	3				2			2	2	2		1

Assessment Scheme:
Two components in semester Continuous Assessment (CA-1, CA-2), End Semester Practical Oral Examination (POE), have 25%, 25% and 50% weightage, respectively.

Assessment Component	Marks
CA1	25
CA2	25
POE	50

CA1 and **CA2** are based on 50% practical assignment.
POE is based on 100% Experiments.

Course Contents

Sr.No.	Practical Title and Contents	Hours
1	To Study and verify the Truth Tables of Logic Gates	**02**
2	To Study De-morgan's theorems.	**02**
3	Code Converters using K-Map.	**02**
4	Half Adder and Full Adder.	**02**
5	Decimal to BCD Encoder	**02**
6	Multiplexer (2:1) and De-multiplexers (1:2)	**02**
7	Flip-flops (SR, D and JK-FF)	**02**
8	4-bit binary asynchronous counter using IC 7493.	**02**
9	Shift Registers.	**02**
10	Study of 4-bit ALU (IC 74181)	**02**
11	Study of 3-bit Synchronous Up-Down counter.	**02**

Textbooks			
Sr.No.	**Title**	**Author**	**Publisher**
1	Modern Digital Electronics	R.P. Jain	McGraw-Hill Publication
2	Computer System Architecture	Morris Mano	Prentice-Hall. .

Reference Books			
Sr.No.	**Title**	**Author**	**Publisher**
1	Structured Computer Organization	Dattu R Joshi	Tata Mc. Graw Hills Pub. Co. Ltd.
2	Digital Design and Computer Architecture	Sarah Harris, David Harris	Morgan Kaufmann.