

SAMARTH EDUCATIONAL TRUST  
ARVIND GAVALI COLLEGE OF ENGINEERING, SATARA  
(AN AUTONOMOUS INSTITUTE)



**Teaching and Evaluation Scheme 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	BSC	Basic Science Course	BS
6	ESC	Engineering Science Course	ES
7	AEC	Ability Enhancement Course	AE
8	VSEC	Vocational and Skill Enhancement Course	VS
9	PCC	Program Core Course	PC
10	IKS	Indian Knowledge System	IK
11	CC	Co-curricular Course	CC

## 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	20	40
									MSE	30		
									CA2	10		
									ESE	50		
2	SEC	25BCA1102	Problem Solving Techniques	3	--	--	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
3	CC	25BCA1103	Computer Architecture	3	--	--	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
4	AEC	25BCA1104	General English-I	1	1	--	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
5	MDE	25BCA1105	Indian Knowledge System-Indian Culture and Civilization	2	--	--	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
6	VEC	25BCA1106	Environmental Science And Sustainability	2	--	--	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
7	AEC	25BCA1107	Foreign Language	1	1	--	--	AU	CA1	25	--	20
									MSE	--		
									CA2	25		
									ESE	--		
8	SEC	25BCA1102	Problem Solving Techniques Laboratory	--	--	2	4	2	CA1	25	20	40
									CA2	25		
									POE	50		
9	CC	25BCA1103	Computer Architecture Laboratory	--	-	2	4	2	CA1	25	20	40
									CA2	25		
									POE	50		
<b>Total</b>				<b>15</b>	<b>2</b>	<b>2</b>	<b>23</b>	<b>19</b>		<b>850</b>		
<b>Total Contact Hours –23</b>				<b>Total Credits – 19</b>								

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	20	40
									MSE	30		
									CA2	10		
									ESE	50		
2	CC	25BCA1202	Data Structures	3	--	--	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
3	CC	25BCA1203	Operating Systems	3	--	--	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
4	SEC	25BCA1204	Object Oriented Programming using Java	3	--	--	3	3	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
5	SEC	25BCA1205	Web Technologies	2	--	--	1	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
6	VAC	25BCA1206	Indian Constitution	2	--	--	2	2	CA1	10	20	40
									MSE	30		
									CA2	10		
									ESE	50		
7	AEC	25BCA1207	Foreign Language	1	1	--	2	A U	CA1	25	--	20
									MSE	--		
									CA2	25		
									ESE	--		
8	CC	25BCA1202 L	Data Structure Laboratory	--	--	2	2	1	CA1	25	--	20
									CA2	25		
									POE	--		
10	SEC	25BCA1204 L	Object Oriented Programming using Java Laboratory	--	--	2	4	2	CA1	25	20	40
									CA2	25		
									POE	50		
11	SEC	25BCA1205	Web Technologies	--	--	2	4	2	CA1	25		40

		L	Laboratory						CA2	25		
									POE	50	2	
			<b>Total</b>	<b>16</b>	<b>1</b>	<b>4</b>	<b>31</b>	<b>21</b>			<b>0</b>	
<b>Total Contact Hours –31</b>				<b>Total Credits – 21</b>								

<b>Title of the Course:</b> <b>Mathematics Foundations to Computer Science I</b> <b>Course Code: 27BCA1101</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	3	-	--	3

**Course Pre-Requisite:**

- Basic understanding of mathematics at 10+2 level Familiar with algebraic expressions, basic functions, and sets ,Logical reasoning and problem-solving skills
- Familiarity with mathematical logic (AND/OR/NOT operations)
- 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:**

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	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3							2	1	1
CO2	2	2	3	3	1					2	1	1
CO3	2	2	3	3	1					2	1	1
CO4	2	2	3							2	1	1
CO5	2	2	3	3	1					2	1	1

### Assessment Scheme:

Two components of in Semester Evaluation (ISE) are CA1 and CA2, One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 70% 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	<b>Set Theory</b> 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	7
2	<b>Relations and Functions</b> 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.	7
3	<b>Matrix</b> 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	7
4	<b>Elementary Graph Theory:</b> 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.	7

<b>5</b>	<p><b>Numerical Methods:</b>          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.</p>	
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**Textbooks:**

Sr.No	Title	Author	Publisher
1	Discrete Mathematics And Its Applications,	Kenneth H. Rosen,	Tata Mcgraw-Hill, Isbn 978-0-07-2880083, 7th Edition
2	Probability, Statistics, Design Of Experiments And Queuing Theory, With Applications Of Computer Science	Trivedi, K.S	Prentice Hall Of India.
3	Elements Of Discrete Mathematics	C L Liu	Tata Mcgraw-Hill
4	Common Statistical Tests	Kulkarni, M.B., Ghatpande, S.B. And Gore, S.D	Satyajeet Prakashan, Pune
5	Mathematical Statistics	J.N. Kapur And H.C. Saxena	S. Chand Publications

**References**

Sr.No	Title	Author	Publisher
1	Mathematical Thinking–Problem Solving And Proofs	John P. D'angelo & Douglas B. West	Prentice Hall, 2 <sup>nd</sup> Ed

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

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

**Course Description:** This course provides a comprehensive introduction to object-oriented programming (OOP), a fundamental programming paradigm used in modern software development. Students will learn how to design and develop robust, maintainable, and scalable software by applying core OOP concepts such as classes, objects, inheritance, encapsulation, polymorphism,

**Course Objectives:**

1. Understand the fundamental principles of problem-solving and their relevance in computer science and real-world applications.
2. Develop analytical and logical thinking skills to break down complex problems into smaller, manageable components.
3. Apply structured problem-solving approaches such as algorithms, flowcharts, and pseudocode to design effective solutions.
4. Gain proficiency in computational thinking techniques including pattern recognition, abstraction, and decomposition.
5. Evaluate and compare multiple solution strategies to select the most efficient and feasible one.

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
CO1	Apply the concepts of propositional logic and proof techniques to solve logical and computational problems.
CO2	Use combinatorial principles to solve problems involving counting, arrangements, and selections.
CO3	Understand and work with algebraic structures such as semigroups, monoids, and groups in theoretical and applied contexts
CO4	Formulate and solve linear programming problems using graphical and simplex methods, including duality concepts.
CO5	Analyze and solve transportation problems using optimization techniques like Vogel's and MODI methods.

**CO-PO Mapping:**

<b>CO \ PO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	2	1	2				1	1		2
<b>CO2</b>	3	2	2	1	2					1		2
<b>CO3</b>	3	2	2	1	2			1	1	1		2
<b>CO4</b>	3	3	3	2	3				1	1	1	2
<b>CO5</b>	3	3	3	2	3				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
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	<p><b>Fundamentals of Problem Solving and Algorithm Design</b>            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</p>	7
2	<p><b>Programming Logic and Control Structures</b>            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,  <b>Translating pseudocode to C</b>            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</p>	7
3	<p><b>Problems on Repetition and Data Representation</b>            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</p>	7

	<ul style="list-style-type: none"> <li>○ Floating point: IEEE 754 format</li> <li>○ Characters: ASCII, UNICODE</li> <li>○</li> </ul>	
4	<b>Arrays, Strings (CO3, CO4)</b> 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	7
5	<b>Modular Programming, Functions, Recursion, and Debugging (CO3, CO4, CO5)</b> 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

<b>Text books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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

<b>Reference Books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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



**Assessment Scheme:**

Two components in semester 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

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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**

Sr. No	Unit Title and Contents	Hours
1	<b>Data representation and Computer Arithmetic</b> 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.	7
2	<b>Boolean Algebra &amp; Logic Gate:-</b> 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.	7
3	<b>Combinational Circuits:-</b> 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.	7
4	<b>Sequential circuit</b> 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.	7
5	<b>CPU, Memory and I/O Organization</b> 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	7

	Virtual Memory. Basics of I/O organisation: types of I/O data transfers	
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<b>Text books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	. Modern Digital Electronics	R.P. Jain	R.P. Jain
2	Computer System Architecture	Morris Mano	Morris Mano

<b>Reference Books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	Structured Computer Organization	Dattu R Joshi	Pearson
2	Digital Design and Computer Architecture	Sarah Harris, David Harris	Pearson

<b>Title of the Course: General English - I</b> <b>Course Code: 25BCA1104</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Pre-Requisite:**

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:**

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:**

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

**CO-PO Mapping**

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

### Assessment Scheme:

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CA 1	10
MSE	30
CA 2	10
ESE	50

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**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	<b>Communication Theory</b> Communication basics: Importance ,process, levels , Forms/methods: verbal and non-verbal , Barriers and solutions , Flow/channels of business communication (Internal ,External ,Vertical, Horizontal, Diagonal, Grapevine), Problems and Solutions.	7
2	<b>Enhancing Language Learning Skills (LSRWT)</b> <b>Effective listening:</b> Process and advantages of listening, poor listening habits, types of listening, strategies for effective listening, listening barriers <b>Effective speaking:</b> Importance, Telephonic Conversation, various oral business contexts/situations, group communication, Preparing effective public communications <b>Effective reading:</b> Important types, overcoming common obstacles, tips and strategies <b>Effective Writing:</b> 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 • <b>Thinking</b> as a learning skill	7

<b>3</b>	<b>Employment Skills</b> Covering letter and resume ,Group Discussion , Interviews (Online / Offline) Introduction to soft skills (Etiquettes, Team Work, Empathy, Problem Solving etc.)	<b>7</b>
<b>4</b>	<b>Formal Business Correspondence</b> Principles, structure (elements),Layout (complete block, modified block, semiblock), Types (enquiry and replies, claim and adjustment)	<b>7</b>

#### Textbooks:

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.

#### References

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.

<b>Title of the Course: Indian Knowledge System</b> <b>Course Code: 25BCA1105</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>2</b>	<b>-</b>	<b>-</b>	<b>1</b>

### Course Pre-Requisite:

The curriculum in Indian universities under the National Education Policy (NEP 2020). These courses aim to introduce students to 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:

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:

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

### CO – PO Mapping

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

**Assessment Scheme:**

Two components of in Semester Evaluation (ISE) are CA1 and CA2, One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

Assessment Component	Marks
CA 1	25
MSE	0
CA 2	25
ESE	-

CA 1 and CA 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

**Course Content:**

Unit No.	Title and Contents	Hours
1	<b>Introduction to IKS</b> Caturdaśa Vidyāsthānam, 74 Kalas, Shilpa Śāstra, Four Vedas, Vedānga, 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	7
2	<b>Foundation concept for Science &amp; Technology</b> 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 Sāṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach to physical reality, constituents of the physical reality, Pramāṇa, Saṃśaya	7

<b>3</b>	<b>Indian Mathematics &amp; Astronomy in IKS</b> 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.	<b>7</b>
<b>4</b>	<b>Indian Science &amp; Technology in IKS</b> 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	<b>7</b>
<b>5</b>	<b>Humanities &amp; Social Sciences in IKS</b> Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguna System BodyMind Intellect- Consciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kautilyan State	<b>7</b>

#### 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

<b>Title of the Course:</b> Environmental Science and Sustainability	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code:</b> BCA109T	<b>2</b>	<b>--</b>	<b>-</b>	<b>2</b>

**Course Pre-Requisite:** 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:

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:

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

**CO-PO Mapping:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO11
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 in Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%,30% and 50% weightage respectively.

Assessment Component	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

**Course Contents**

Unit	Unit Title and Contents	Hours
1	<p><b>Understanding Environment, Natural Resources, and Sustainability</b></p> <p>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</p>	06

	conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education	
2	<p><b>Ecosystems, Biodiversity, and Sustainable Practices</b></p> <p>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</p>	<b>06</b>
3	<p><b>Environmental Pollution, Waste Management, and Sustainable Development</b></p> <p>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</p>	<b>06</b>
4	<p><b>Social Issues, Legislation, and Practical Applications</b></p> <p>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</p>	<b>06</b>

<b>Text Books</b>			
<b>Sr. No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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 cristo cure (4th ed.).	Rajagopalan, R.	Oxford University Press.

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

<b>Title of the Course :Foreign Language</b> <b>Course Code: 25BCA1207</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>1</b>	<b>--</b>	<b>-</b>	<b>AU</b>

### Course Pre-Requisite:

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:

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:

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

### CO-PO Mapping:

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

**Assessment Scheme:**

Assessment Component	Marks
CA1	10
MSE	--
CA2	10
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

<b>Title of the Course: Problem Solving Techniques Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: 25BCA1102L</b>	-	-	2	1

**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:**

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 pseudocode 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:**

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

**CO-PO Mapping:**

	<b>P01</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	3	1	0		1						3
<b>CO2</b>		3	3	0	3	0						
<b>CO3</b>			3	0		0			3			
<b>CO4</b>			0	3		3		3			1	

**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	<p><b>Experiment 1: Basic Input/Output and Simple Arithmetic</b></p> <p>a) Write a C program to print Welcome message.</p> <p>b) Write a C program to input two numbers from user and perform arithmetic operations.</p> <p>c) . Write a C program to convert temperature from degree celcius to fahrenheit and vice versa.</p>	02
2	<p><b>Experiment 2: Loops</b></p> <p>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.</p> <p>b) Given an input positive integer number, Write a c program to display odd numbers from in the range [1,n] using while loop.</p> <p>c) Write a C program to display the following patterns.</p> <pre> \$           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 </pre> <p>d) Write a program to display the first n terms of Fibonacci sequence using do while loop.</p>	02

<b>3</b>	<p><b>Experiment 3: Decision Making</b></p> <p>a. Write down c program to check if given positive integer number is a palindrome or not.</p> <p>b. Compute character grade from the marks(<math>0 \leq \text{marks} \leq 100</math>) 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.</p> <p>c. Write down a C program to check if a given positive integer number is a prime number or not.</p>	<b>02</b>
<b>4</b>	<p><b>Experiment 4: Arrays</b></p> <p>a. Write a C program to compute a maximum of 8 numbers.</p> <p>b. Write a C program to accept elements into the array and calculate the sum, average, maximum number and minimum number from array.</p> <p>c. Write a C program to perform matrix operations addition, subtraction and transpose.</p>	<b>02</b>
<b>5</b>	<p><b>Experiment 5: Strings</b></p> <p>a. Write a C program to implement your own string length and string reversal functions.</p> <p>b. Write a C program to check whether the string is palindrome or not.</p>	<b>02</b>
<b>6</b>	<p><b>Experiment 6: Recursion</b></p> <p>a. Write a C recursive program to count the number of digits of a positive integer number.</p> <p>b. Write a C recursive program to compute <math>x^y</math> using only multiplication.</p> <p>c. Write a C recursive program to calculate Factorial of a number.</p>	<b>02</b>

**Textbooks/Software:**

<b>Textbooks</b>			
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

<b>Reference Books</b>			
Sr.No.	Title	Author	Publisher
1	The C Programming Language	Brian W. Kernighan and Dennis Ritchie,	Pearson

<b>2</b>	Problem Solving and Program Design in C	Jeri Hanly and Elliot Koffman	Pearson
<b>3</b>	Let Us C	Y S Kanetkar	BPB Publications

<b>Title of the Course: Computer Architecture Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: 25BCA1103L</b>	-	-	2	2

**Course Pre-Requisite:** 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:**

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:**

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

**CO-PO Mapping:**

	<b>P01</b>	<b>P02</b>	<b>P03</b>	<b>P04</b>	<b>P05</b>	<b>P06</b>	<b>P07</b>	<b>P08</b>	<b>P09</b>	<b>P010</b>	<b>P011</b>	<b>P012</b>
<b>CO1</b>								2	2	3		1
<b>CO2</b>								2	2	2		1
<b>CO3</b>								1		2	1	
<b>CO4</b>								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
MSE	-
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/Software:**

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

<b>Reference Books</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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.

<b>Title of the Course: Mathematics Foundation to Computer Science -II</b> <b>Course Code: 25BCA1201</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	-	-	2	1

**Course Pre-Requisite:**

Basic understanding of high school mathematics. With set theory, algebraic operations, and logical reasoning.

**Course Description:**

This course introduces fundamental concepts in mathematical logic, combinatorics, algebraic structures, and optimization techniques such as linear programming and transportation methods. It equips students with analytical and problem-solving skills essential for advanced studies and real-world applications in mathematics and related fields.

**Course Objectives:**

1. To mathematical logic, including propositional logic, truth tables, and proof techniques in solving computational and logical problems
2. To understand principles of combinatory such as counting, permutations and combinations and binomial Theorems for analyzing discrete structures.
3. To understand of algebraic structures including semigroups, monoids, groups, and Abelian groups
4. To solve linear programming problems using graphical methods, the simplex method and duality for optimal decision-making
5. To apply methods like the north-west corner rule, least cost method, Vogel’s approximation

**Course Outcomes:**

<b>CO1</b>	Apply the concepts of propositional logic and proof techniques to solve logical and computational Problems.
<b>CO2</b>	Use combinatorial principles to solve problems involving counting, arrangements, and selections
<b>CO3</b>	Understand and work with algebraic structures such as semigroups, monoids, and groups in theoretical and applied contexts
<b>CO4</b>	Formulate and solve linear programming problems using graphical and simplex methods, including duality concepts.
<b>CO5</b>	Analyze and solve transportation problems using optimization techniques like Vogel’s And MODI methods.

**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 in Semester Evaluation (ISE) are CA1 and CA2, One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

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

CA 1 and CA 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

**Course Content:**

Unit No.	Title and Contents	Hours
1	<b>UNIT I: Mathematical Logic</b> Propositional Logic : Statement, Types of statement Logical Connectives, Translating English Sentences, Truth Tables, Tautologies, Contradiction , Universal and Existential Quantifiers, Logical Equivalences, Logic gates and circuits , Methods of proofs: Rules of inference for propositional logic, modus ponens, modus tollens, Introduction to Proof Techniques, Direct Proof, Proof by Contradiction, Mathematical induction .	7
2	<b>UNIT II: Combinatorics</b> Basics of Counting, Rules of Sum and Product, Permutations and Combinations , Principle of Inclusion and Exclusion, Pigeonhole Principle Binomial coefficients, Binomial theorem	7
3	<b>UNIT III: Algebraic Structure:</b> The structure of algebra, Algebraic Systems, Semi Groups, Monoids, Groups, Abelian groups and their examples	7
4	<b>Unit IV Linear Programming and Optimization Techniques:</b> Introduction, LP formulation, Graphical method for solving LPs with two variables, Special cases in graphical methods, Simplex method, Duality.	7
5	<b>Unit V Transportation Problem Methods and Applications :</b> Transportation problem: Definition, Linear form, North-west corner method, least cost method, Vogel's approximation method for finding feasible solution, MODI method for finding optimum solution.	7

**Textbooks:**

<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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

**References**

<b>Sr. No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
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	Kenneth . H . Rosen	McGraw Hill Education Pvt. Ltd.

<b>Title of the Course: : Data Structures</b> <b>Course Code: 25BCA1202</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Pre-Requisite :-**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:**

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

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
CO1	Understand and explain the fundamental concepts of data structures, including arrays, linked lists, stacks, queues, trees, and graphs.
CO2	Implement linear and non-linear data structures using a high-level programming language (e.g., C, C++, Java, or Python).
CO3	Apply appropriate data structures in problem-solving and algorithm design to develop efficient software solutions.
CO4	Demonstrate proficiency in recursion and understand its application in data structures like trees and divide-and-conquer algorithms.

**CO-PO Mapping:**

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

**Assessment Scheme:**

Two components of in Semester Evaluation (ISE) are CA1 And CA2, One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

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

CA 1 and CA 2 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**

Sr.No.	Unit Title and Contents	Hours
1	<b>Introduction and Overview</b> Definition, Classification and Operations of Data Structures. Algorithms: Complexity, Time-Space Tradeoff. Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operations on Linear 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, Representation of Two Dimensional Arrays in Memory, Matrices and Sparse Matrices, Multi-Dimensional Arrays.	7
2	<b>Linked List and Arrays</b> 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.	7
3	<b>Hashing and Collision:</b> Hashing, Hash Tables, Types of Hash Functions, Collision, Collision Resolution with Open Addressing and Chaining	7
4	<b>Stacks</b> 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.	7

5	<b>Recursion</b> Definition, Recursive Notation, Runtime Stack, Applications of Recursion: Factorial of Number, GCD, Fibonacci Series and Towers of Hanoi. 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.	7
6	<b>Graphs and Trees</b> Definition, Terminology, Representation, Traversal. 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.	7

<b>Text books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	Expert Data Structures with C	R.B. Patel	Khanna Book Publishing Company,
2	Data Structures with C	Seymour Lipschutz,	Schaum's Outlines, Tata McGraw-Hill,
3	Data Structures Through C	Yashavant Kanetkar	BPB Publications,

<b>Reference Books</b>			
<b>Sr.No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	Expert Data Structures with C	R.B. Patel	Khanna Book Publishing Company,
2	Data Structures with C	Seymour Lipschutz,	Schaum's Outlines, Tata McGraw-Hill
3	Data Structures Through C	Yashavant Kanetkar	BPB Publications
4	Data Structures Using C	Reema Thareja	Oxford University Press,

<b>Title of the Course: Operating System</b> <b>Course Code: 25BCA1203</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Pre-Requisite:**

Basic knowledge of computer organization and architecture and understanding of programming concepts, especially in C or C++.

**Course Description:**

This course introduces the fundamental concepts of operating systems. It covers process management, memory management, and file systems. Students learn about scheduling, synchronization, and deadlocks. The course also includes concepts of virtual memory and system security. It prepares students to understand and analyze OS design and functionality.

**Course Objectives:**

1. To understand different types and structures of operating systems designed for Mobile, Desktop and high-performance computing servers
2. To identify the core functionalities of operating systems such as process management, memory management and file system management
3. To analyze core functionalities of operating system to cater the need of end users and services  
Effectively

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
CO1	Possess knowledge of Operating Systems and their types
CO2	Apply the concept of a process and scheduling algorithms.
CO3	Realize the concept of deadlock and different ways to handle it.
CO4	Understand various memory management techniques and file system.
CO5	Explore the synchronization mechanism and providing solutions to critical sections

**CO-PO Mapping:**

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

CO5	3	3	3	2	3			1	1	1		1
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### Assessment Scheme:

Two components of Continuous Assessment (CA1, CA2), 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	<b>Operating system structure and Organization:-</b> Computer-System Organization- Architecture - Structure and operations of Operating System –Services - Interface between user and operating system -System Calls -System Boot	7
2	<b>Process and Thread Management:-</b> Process states -context switching-process control block – scheduling - Operations on Processes -Inter-process Communication - Threads Overview, Multithreading Models	7
3	<b>Process Synchronization</b> Race Condition - Critical section problem, Peterson’s Solution, Mutex Locks, Semaphores, Classic Problems of Synchronization- Producer-Consumer problem, Readers-writer problem	7
4	<b>CPU Scheduling and Deadlock</b> Scheduling Algorithms – First come first served (FCFS),Shortest job first(SJF) scheduling -Deadlocks- System Model, Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance	7

5	<b>Main Memory:-</b> Swapping- Contiguous Memory Allocation - First Fit, Best Fit, Worst Fit- Segmentation- Paging - Virtual Memory- Demand Paging -Page Fault - LRU, OPR Page Replacement Algorithms, -Allocation of Frames –Thrashing	7
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<b>Text Books</b>			
Sr.No	Title	Author	Publisher
1	Operating system concepts, 2020, Tenth Edition,	A.Silberschatz, P.B. Galvin & G. Gagn	John Wiley.
2	Operating Systems,2nd Edition,.	Achyut S Godbole	McGraw Hill Publications
3	Operating Systems, Internals & Design Principles, , 6th Edition,	William Stalling	.Pearson Publication

<b>Reference Books</b>			
Sr.No	Title	Author	Publisher
1	Operating systems-Internals and Design Principles”, 2018, Ninth Edition ,Prentice- Hall.	W. Stallings,	John Wiley & Sons
2	Operating Systems	Achyut S. Godbole	McGraw Hill Education
3	Operating systems-Internals and Design Principles”, 2018, Ninth Edition ,Prentice- Hall.	W. Stallings,	John Wiley & Sons

<b>Title of the Course: Object Oriented Programming Using Java</b> <b>Course Code: 25BCA1204</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**Course Pre-Requisite:** A basic understanding of programming concepts such as variables, datatypes, control structures (if-else, loops), and functions.

**Course Description:** This course provides a comprehensive introduction to object-oriented programming (OOP), a fundamental programming paradigm used in modern software development. Students will learn how to design and develop robust, maintainable, and scalable software by applying core OOP concepts such as classes, objects, inheritance, encapsulation, polymorphism,

### Course Objectives:

In this course, you will learn about:

1. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc. and exception handling mechanisms.
2. To understand streams and efficient user interface design techniques.
3. Understand the principles of inheritance, packages and interfaces.

### Course Outcomes:

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
CO1	Introduce the object oriented programming system concept
CO2	Understanding the syntax and semantics of java programming language, basic concepts of OOP implementation and use of a variety of basic control structures including selection and repetition, classes and objects.
CO3	Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes
CO4	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
CO5	Design event driven GUI and web related applications like Applets which mimic the real word scenarios.

### CO-PO Mapping:

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

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

### 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

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	<b>Fundamentals of Object Oriented Programming:</b> Basic Concepts of Object Oriented Programming (OOP), Benefits and Applications of OOP. <b>Java Evolution:</b> Java Features, Difference between Java, C and C++, Java and Internet, Java Environment. <b>Overview of Java Language:</b> Introduction to Simple Java Program, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program And JVM, Command Line Arguments.	7
2	<b>Constants, Variables and Data Types:</b> Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting <b>Operators &amp; Expressions:</b> 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. <b>Decision Making, Branching &amp; Looping:</b> Decision Making with control satatement, Looping statements, Jump in loops, Labelled loops.	7
3	<b>Classes, Objects and Methods:</b> Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance. <b>Arrays, Strings and Vectors:</b> 1D arrays, Creating an Array, 2D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types. <b>Inheritance:</b> Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism, overriding methods, concept of Multithreading in Java	7
4	<b>Packages:</b> API Packages, System packages, Creating and accessing packages, Creating user defined packages, Adding class to a package.	

	<b>Exception Handling:</b> Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions	<b>7</b>
5	<b>Thread:-</b> creating thread, Extending of thread class, life cycle of thread, using thread methods, implementing the runnable interface <b>Applets:-</b> Concepts of Applets, Differences between Applets and Applications, Life Cycle of an Applet, Applet tag, Creating and Executable Applets, Passing Parameters to Applets.	<b>8</b>

### Text Books:

Sr.No.	Title	Author	Publisher
1	Programming with java A Primer Fourth edition	E Balagurusamy	Tata McGraw-Hill Publishing Company Ltd
2	Java: The Complete Reference. 12th edition.	Schildt, H. (2022).	McGraw-Hill Education
3	Introduction to Java Programming (Comprehensive Version), Seventh Edition,	Daniel Liang,	Pearson.

### Reference Books

Sr.No.	Title	Author	Publisher
1	The Complete Reference Java 2 –, 3rd Edition,	Patrick Naughton & Hebert Schildt	TMH
2	Java Programming (for java beginners)”, First Edition, Volume 1, 2021	S. Sree Priya	VR1 Publications, Chennai
3	2005, Core Java™2 Volume I, Fundamental 7th Edition, Pearson Education.	Cay S. Horstmann and Gary Cornell	Pearson Education.
4	Core JAVA 2015.	Tanweer Alam	Khanna Book Publishing Company Private Limited
5	Programming in Java, 2nd Edition, 2014.	S. Malhotra and S. Choudhary	Oxford University Press

<b>Title of the Course: Web Technology</b> <b>Course Code: 25BCA1205</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>2</b>	<b>-</b>	<b>-</b>	<b>2</b>

**Course Pre-Requisite:** Basic knowledge of computer fundamentals and networking fundamentals (client–server architecture, HTTP/HTTPS). Familiarity with basic HTML will be an added advantage.

**Course Description:** This course introduces the fundamentals of web development, focusing on HTML for structuring web content and basic CSS for styling. Students will learn how to design and build responsive, user-friendly webpages using standard web technologies. The course emphasizes practical skills through hands-on projects involving webpage layout, forms, links, images, and multimedia integration

**Course Objectives:**

1. To understand the concepts and architecture of the World Wide Web, Mark up languages along with Cascading Style Sheets.
2. Understand the architecture and components of the World Wide Web, including protocols like HTTP, HTTPS, DNS, and web servers.
3. Design static and dynamic web pages using HTML, CSS, and JavaScript.
4. Build responsive web designs using modern CSS frameworks (e.g., Bootstrap).
5. Implement client-side scripting with JavaScript for form validation, DOM manipulation, and interactivity.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
CO1	Enlist various HTML elements and tags
CO2	Use HTML elements and tags
CO3	Apply CSS and Java script features.
CO4	Design a website using HTML, CSS and JavaScript.
CO5	Enlist various HTML elements and tags

**CO-PO Mapping:**

<b>CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>P011</b>	<b>PO12</b>
<b>CO1</b>	3	2	1	-	2	-	-	-	1	1	1	1
<b>CO2</b>	3	3	2	-	2	-	-	-	2	2	1	2
<b>CO3</b>	3	3	3	-	3	-	-	-	2	2	1	2
<b>CO4</b>	3	3	3	-	3	-	-	-	3	3	2	3
<b>CO5</b>	3	2	2	-	2	-	-	-	1	1	-	1

**Assessment Scheme:**

Two components of Continuous Assessment (CA-1, CA-2), Mid Semester Examination (MSE) and End Semester Examination (ESE) have 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

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	<b>Introduction to WWW</b> Introduction to www, Protocols and Programs, Applications and development tools, web browsers, DNS, Web hosting Provider, Setting up of Windows/Linux/Unix web servers, Web hosting in cloud, Types of Web Hosting	4
2	<b>Introduction to HTML:</b> Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, Body tags, Paragraph Tags. Tags for FORM Creation, TABLE, FORM, TEXTAREA, SELECT, IMG, IFRAME FIELDSET, ANCHOR Lists in HTML, Introduction to DIV tag, NAVBAR Design.	4
3	<b>Introduction to CSS and Bootstrap</b> Introduction to CSS, types, Selectors, and Responsiveness of a web page. Introduction to Bootstrap, downloads/linking, using classes of Bootstrap, understanding the Grid System in Bootstrap.	4
4	<b>Introduction to Java Script</b> Introduction to JavaScript: Functions and Events, Document Object model traversing using JavaScript. Output System in JavaScript i.e. Alert, throughput, Input box, Console. Variables and Arrays in Java Script. Date and String handling in JavaScript.	4
5	<b>Introduction to AJAX</b>	4

	Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.	
6	<b>Introduction to XML</b> Introduction to XML: uses, Key concepts, DTD 8 schemas, XSL, XSLT, and XSL Elements and transforming with XSLT. Introduction to XHTML. JSON: Introduction to JSON, Keys and Values, Types of Values, Arrays, Objects	4

<b>Text Books</b>			
<b>Sr. No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	HTML Black Book	Steven Holzner	Dreamtech Press
2	Web Applications : Concepts and Real World Design	Craig D. Knuckles & David S. Yuen	Wiley-India
3	Internet and World Wide Web How to program	Paul J. Deitel	Prentice Hall PTR, USA

<b>Reference Books</b>			
<b>Sr. No</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1	HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2016	Dream Tech	DT Editorial Services
2	Mastering HTML, CSS & Java Script, 2016	Laura Lemay	Web Publishing, BPB Publications
3	The Complete Reference HTML & CSS, Fifth Edition, 2017	Thomas A. Powell	Tata McGraw-Hill Education

<b>Title of the Course: Indian Constitution</b> <b>Course Code: BCA207T</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

### Course Pre-Requisite:

Basic understanding of drafting of the constitution. Along with this understanding the fundamental rights and fundamental duties assigned to us by the Indian Constitution, Directive principle of state policies and three tier government system.

### Course Description:

1. This course helps to understand the drafting of the Indian Constitution.
2. This course helps to know the fundamental rights and fundamental duties assigned to us by the Indian Constitution.
3. This will enable you to know the three tier government system implemented in INDIA
4. This course will make you familiar to some of the most important constitution amendment acts since 1951.

### Course Objectives:

1. To understand the origin and framework of the Indian Constitution
2. To familiarize with rights, duties, and directive principles
3. To understand the distribution of powers.
4. To understand the constitutional amendments and committees.
5. To get comprehensive study of the Panchayat Raj system

### Course Outcomes:

CO	After the completion of the course the student should be able to
CO1	The making of the Indian Constitution and its unique features
CO2	Interpret fundamental rights, duties, directive principles, and judicial writs.
CO3	Describing the legislative, executive, and judicial powers under the three-tier system of governance.
CO4	Summarize major constitutional amendments, important major committees, and powers of the Parliament and State Assemblies.
CO5	Analyze the structure, functions, and significance of Panchayat Raj institutions and local governance.

### CO – PO Mapping

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

**Assessment Scheme:**

Two components of in Semester Evaluation (ISE) are CA1 and CA2, End Semester Examination (ESE) in Examination pattern.

Two components of in Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weightage respectively.

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

CA 1 and CA 2 are based on Assignment/Declared test/Quiz/Seminar/Group discussions/presentation, etc.

**Course Content:**

Unit No.	Title and Contents	Hours
1	<b>Making of the Constitution</b> National and Nationality, 1935 Indian Independence act, Embedded system of constitution, Rigidity and flexibility of constitution, Citizenship of India, Preamble: 42 <sup>nd</sup> constitution amendment act.	5
2	<b>Rights and Duties</b> Fundamental right, Fundamental duties, Directive principles of state policies, writs issued by Supreme Court, High Court, CAA	5
3	<b>Three tiers of Indian Constitution</b> Legislative powers of Indian Gov., Executive powers, Judicial powers, Rajya Sabha, Lok Sabha, Bills passed by simple and special majority, Judges and Minister Pay Scale	5
4	<b>Constitution Amendment Acts</b> Mini Constitution, Famous committees: Loknathan committee, Lokpal Bill, powers of parliament and state legislative assembly.	5
5	<b>Panchayat Raj</b> Municipal Corporation, Panchayat Samiti, Barter System, reservation system 1952 acts and role in North Eastern States, Village taluka district division implementations.	5

**Textbooks:**

<b>Sr.No</b>	<b>Title</b>	<b>Author/s</b>
1	Introduction to the Constitution of India	Durga Das Basu
2	Indian Polity	M. Laxmikanth
3	Our Constitution: An Introduction to India's Constitution and Constitutional Law, National Book Trust	Subhash Kashyap

**References**

<b>Sr. No</b>	<b>Title</b>	<b>Author</b>
1	The Indian Constitution: Cornerstone of a Nation	Oxford University Press
2	Constitution of India	V.N. Shukla
3	Indian Government and Politic	J.C. Johari

<b>Title of the Course :Foreign Language Course Code: 25BCA1207</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	<b>1</b>	<b>--</b>	<b>-</b>	<b>AU</b>

### Course Pre-Requisite:

Desire to get acquainted with the Foreign 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:

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:

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

### CO-PO Mapping:

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

### Assessment Scheme:

<b>Assessment Component</b>	<b>Marks</b>
CA1	10
MSE	--
CA2	10
ESE	--

## Course Contents

Unit No.	Unit Title and Contents	Hours
1.	Modified Kana Contracted Sounds	03
2.	Nationality Colors	03
3.	Rules of reading- Small " つ " " ん " sound, long pronunciation Body parts	03
4.	Katakana Clock/ Time	03

Text Books			
Sr. No.	Title	Author	Publisher
1	Minano Nihongo	Survival Japanese Language Research Group	Goyal
2	Genki	Eri Banno	The Japan Times Publishing

<b>Title of the Course: Data Structures Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: 25BCA1202L</b>	-	-	2	1

**Course Pre-Requisite:** 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:**

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

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	Understand and explain the fundamental concepts of data structures, including arrays, linked lists, stacks, queues, trees, and graphs.
<b>CO2</b>	Implement linear and non-linear data structures using a high-level programming language (e.g., C, C++, Java, or Python).
<b>CO3</b>	Apply appropriate data structures in problem-solving and algorithm design to develop efficient software solutions.
<b>CO4</b>	Demonstrate proficiency in recursion and understand its application in data structures like trees and divide-and-conquer algorithms.
<b>CO5</b>	Analyze and compare the time and space complexity of basic algorithms and data structures.

**CO-PO Mapping:**

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

**Assessment Scheme:**

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

Assessment Component	Marks
CA1	25
MSE	--
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	Write a program for insertion and deletion operations in an array	02
2	Write a program to search for an element in an array using Linear Search and Binary Search	02
3	Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.	02
4	Write a program to merge two arrays.	02
5	Write a program to add and subtract two matrices	02
6	Write a program to multiply two matrices.	02
7	Write a program to implement stack operations using an array.	02
8	Write a program to implement stack operations using a linked list.	02
9	Write a program to add two polynomials using a linked lists.	02
10	.Write a program to evaluate a postfix expression using a stack.	02
11	Write a program to implement simple queue operations using an array	02
12	Write a program to perform insertion operation in a binary search tree.	02

<b>13</b>	Write a program to insert an element into a Singly Linked List: (a) At the beginning (b) At the end (c) At a specified position	<b>02</b>
<b>14</b>	Write a program to perform the following operations in a Doubly Linked List: (a) Create (b) Search for an element 10. Write a program to perform	<b>02</b>
<b>15</b>	Write a program to implement simple queue operations using an array.	<b>02</b>

**Textbooks/Software:**

<b>Textbooks</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>
<b>1</b>	Expert Data Structures with C	R.B. Patel	Khanna Book Publishing Company,
<b>2</b>	Data Structures with C	Seymour Lipschutz,	Schaum's Outlines, Tata McGraw-Hill,

<b>Reference Books</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>
<b>1</b>	Data Structures Through C	Yashavant Kanetkar	BPB Publications
<b>2</b>	Data Structures Using C	Reema Thareja	Oxford University Press,

<b>Title of the Course: Object Oriented Programming using Java Laboratory</b> <b>Course Code: 25BCA1204L</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
	-	-	2	1

**Course Pre-Requisite:** Basic programming knowledge and basic Java syntax.

**Course Description:**

The Java Programming Lab is designed to provide hands-on experience in Java programming, focusing on the practical application of core programming principles and Object-Oriented Programming (OOP) concepts. The course aims to bridge the gap between theoretical knowledge and real-world programming through structured lab exercises and projects. Students will develop skills in writing efficient, reusable, and modular code while applying best practices in software development. By the end of the course, students will be able to solve complex problems, build applications, and effectively use debugging, testing, and version control tools.

**Course Objectives:**

1. To provide hands-on experience in writing, compiling, and executing Java programs using basic programming constructs like variables, loops, and conditionals.
2. To introduce students to core Object-Oriented Programming (OOP) concepts such as classes, objects, inheritance, polymorphism, encapsulation, and method overloading in Java.
3. To develop the ability to design and implement modular, reusable, and maintainable code by applying OOP principles and best practices.

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
<b>CO2</b>	Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
<b>CO3</b>	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structure
<b>CO4</b>	Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.

**CO-PO Mapping:**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	2	2	-	-	3	-	-	1	-	-	-	-
<b>CO2</b>	2	3	2	-	-	-	-	-	-	-	-	-
<b>CO3</b>	2	-	3	-	3	-	-	-	2	2	-	-
<b>CO4</b>	-	-	-	-	3	-	-	-	2	-	-	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.	Demonstration of installation and configuration of Jdk with Command line. a) Write a java program to take user input and print it. b) Write a java program to swap two numbers.	02
2.	Write a java program to find the largest number out of n natural numbers.	02
3.	Write a java program to find the Fibonacci series & Factorial of a number using recursive and non-recursive functions.	02
4.	Write a java program to multiply two given matrices	02
5.	Write a Java program for sorting a given list of names in ascending order	02
6.	Write a Java program that checks whether a given string is a palindrome or not . Ex: MADAM is a palindrome.	02
7	Write a Java program that takes a number from the user and generates an integer between 1 and 7. It displays the weekday name.	02
8	Write a Java program that takes a year from the user and prints whether it is a leap year or not.	02
9.	Write a java program to read n number of values in an array and display it in reverse order.	02
10	Write a Program to Print Pyramid Number Pattern in Java. * *** ***** *****	02

11	Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.	02
12	Write a Java Program to Find the Largest Element in Array	02
13	Create a JAVA class called Student with the following details as variables within it. a. USN, NAME, BRANCH, PHONE, PERCENTAGE b. Write a JAVA program to create n Student objects and print the USN,Name, Branch, Phone, and percentage of these objects with suitable headings.	02
14	Write a Java program to create a Date object using the Calendar class.	02
15	Write a Java program to create an Applet that reads Employee information using parameters and displays name of employee, designation, salary and tax.	02

**\*Any 10 practicals /experiments to be conducted.**

**Textbooks/Software:**

<b>Textbooks</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1.	Programming with java A Primer Fourth edition	E Balagurusamy	Murach's Publication
2.	Java: The Complete Reference. 12th edition.	Schildt, H.	Herbert Schildt
3.	Introduction to Java Programming (Comprehensive Version), Seventh Edition,	Daniel Liang,	Y. Daniel Liang

<b>Reference Books:</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author</b>	<b>Publisher</b>
1.	The Complete Reference Java 2 –, 3rd Edition,	Charles Severance	University of Michigan,
2.	Java Programming (for java beginners)”, First Edition, Volume 1,	Dr. R. Nageswara Rao	Dreamtech Press, 1st Edition,
3.	2005, Core Java™2 Volume I, Fundamental 7th Edition, Pearson Education.	Allen B. Downey	O'Reilly Media, 2nd Edition
4.	Core JAVA.	Dr. Anita Goel	Pearson

<b>Title of the Course: Web Technology Laboratory</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credit</b>
<b>Course Code: 25BCA1205L</b>	-	-	2	1

**Course Pre-Requisite:** Basic knowledge of computer fundamentals and networking fundamentals (client–server architecture, HTTP/HTTPS). Familiarity with basic HTML will be an added advantage.

**Course Description:** This course introduces the fundamentals of web development, focusing on HTML for structuring web content and basic CSS for styling. Students will learn how to design and build responsive, user-friendly webpages using standard web technologies. The course emphasizes practical skills through hands-on projects involving webpage layout, forms, links, images, and multimedia integration.

**Course Objectives:**

1. To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets.
2. To understand the concepts of event handling and data validation mechanisms.
3. To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full stack web development.
4. To develop modern interactive web applications

**Course Outcomes:**

<b>CO</b>	<b>After the completion of the course the student should be able to</b>
<b>CO1</b>	Identify and use various HTML elements and attributes to create structured web pages.
<b>CO2</b>	Apply CSS styling techniques to enhance the presentation and layout of web pages.
<b>CO3</b>	Implement interactivity in web pages using JavaScript and basic DOM manipulation.
<b>CO4</b>	Develop responsive web pages using HTML, CSS, and JavaScript that meet specific design requirements.

**CO-PO Mapping:**

	<b>P01</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	3	2	1	0	1	-	-	-	-	1	-	1
<b>CO2</b>	3	2	2	1	1	-	-	-	-	1	-	1
<b>CO3</b>	3	3	3	2	2	-	-	-	1	2	-	2
<b>CO4</b>	3	3	3	3	3	-	1	-	2	2	1	3

**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	Create Your Resume using different HTML tags (use text, color and lists.)	02
2	Create your class time table using table tag.	02
3	Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.	02
4	Create web page using Frame with header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.	02
5	Create web page for student admission form using different form elements in HTML.	02
6	Create a Web Page of a super market using internal CSS.	02
7	Use Inline CSS to format your resume created through HTML tags.	02
8	Use External CSS to format your time table created..	02

9	Use all the CSS (inline, internal and external) to format college web page that you have created.	02
10	Write a HTML Program to create your college website for mobile device using CSS.	02
11	Write a JavaScript program using Switch case.	02
12	Develop a Simple calculator for addition, subtraction, multiplication and division operations using JavaScript.	02
13	Create HTML form for Student Information like Register Number, Name, Mobile Number, DOB and Email-Id with validations using JavaScript. (Use required field validator and length validator)	02
14	Write an HTML program to create login page with validations using JavaScript. (Use Regular Expressions for validations)	02
15	Create XML schema for Student Information.	02

**\*Any 10 practical's /experiments to be conducted.**

**Textbooks/Software:**

<b>Textbooks</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>
1.	HTML Black Book	Steven Holzner	Dreamtech Press
2.	Web Applications : Concepts and Real World Design	Craig D. Knuckles & David S. Yuen	Wiley-India
3.	Internet and World Wide Web How to program	Paul J. Deitel	Prentice Hall PTR, USA

<b>Reference Books</b>			
<b>Sr.No.</b>	<b>Title</b>	<b>Author/s</b>	<b>Publisher</b>

1.	HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery	Dream Tech	University of Michigan, Version 2.7.0.
2.	Mastering HTML, CSS & Java Script	Laura Lemay	Dreamtech Press, 1st Edition.
3.	The Complete Reference HTML & CSS, Fifth Edition	Thomas A. Powell	O'Reilly Media, 2nd Edition.