



**Hirachand Nemchand College of
Commerce, Solapur**
(Autonomous College)



(Affiliated to P.A.H Solapur University, Solapur)

Name of Faculty: Computer Science & Information technology
Choice Based Credit System
(NEP)

Syllabus for
Bachelor of Computer Application (B.C.A)

First Year
Semester I & II

With
(AICTE NEP 2023)
(w. e. from June 2025-26)

Internal Assessment:

The medium of instruction & examination will be only in English.

Details of Internal examination:

Particulars	Marks (2 credit paper)	Marks (4 credit Paper)
Attendance	05 Marks	05 Marks
Mid Test	10 Marks	20 Marks
Home Assignments	05 Marks	05 Marks
Group Exercise / Seminars / Projects	--	10 Marks
Total	20	40

Semester I

	Subject Code	Subject Name	L	T	P	Total Credit	ISE	ESE	Total Marks
BCAC C111	CC101	Mathematics Foundations	3	0	0	3	40	60	100
BCASE 111	SEC101	Problem Solving Techniques	3	0	4	5	40	60	100
BCAC C112	CC102	Computer Architecture	3	0	4	5	40	60	100
BCAA E111	AEC101	General English - I	1	1	0	2	40	60	100
BCAM D111	MDE101	Indian Knowledge System	2	0	0	2	40	60	100
BCAV A111	VAC101	Environmental Science and Sustainability	2	0	0	2	40	60	100
BCAA E112	AEC102	Sanskrit - I	1	1	0	0	40	60	100
BCACS 111	CS111	Basic of Web Programming	2	0	0	2	40	60	100
BCACS 112	CS112	Wordpress	0	0	1	1	40	60	100
Total Credits (19)						22	360	540	900

Semester II

	Subject Code	Subject Name	L	T	P	Total Credit	ISE	ESE	Total Marks
BCAC C121	CC103	Mathematics Foundations	3	0	0	3	40	60	100
BCAC C122	CC104	Data Structure	3	0	4	5	40	60	100
BCAC C123	CC105	Operating System	3	0	2	4	40	60	100
BCASE 121	SEC102	Object Oriented Programming Using Java	3	0	4	5	40	60	100
BCASE 122	SEC103	Web Technology	1	0	2	2	40	60	100
BCAV A121	VAC102	Indian Constitution	2	0	0	2	40	60	100
BCAA E121	AEC103	Sanskrit - II	1	1	0	0	40	60	100
BCACS 123	CS123	PowerBI	0	0	1	1	40	60	100
BCACS 124	CS124	Mini Project	0	0	2	0	40	60	100
Total Credits(21)						22	360	540	900

An **UG CERTIFICATE IN COMPUTER APPLICATION** will be awarded, if a student wishes to exit at the end of First year.

SEMESTER -I

Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CC101					
Paper Name:	Mathematics Foundations I	ESE*	ISE*	Total	3/0	3
Paper Code:	BCACC111	60	40	100		

Course Objectives

CO1: Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.

CO2: This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.

CO3: This course demonstrates how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze.

UNIT I: Set, Relation and Function:

Set, Set Operations, Properties of Set operations, Subset, Venn Diagrams, Cartesian Products. Relations on a Set, Properties of Relations, Representing Relations using matrices and digraphs, Types of Relations, Equivalence Relation, Equivalence relation and partition on set, Closures of Relations, Warshall's algorithm.

Functions, properties of functions (domain, range), composition of functions, surjective (onto), injective (one-to-one) and bijective functions, inverse of functions.

Some useful functions for Computer Science: Exponential and Logarithmic functions, Polynomial functions, Ceiling and Floor functions.

UNIT II: Counting and Recurrence Relation:

Basics of counting, Pigeonhole principle, permutation, combination, Binomial coefficients, Binomial theorem.

Recurrence relations, modelling recurrence relations with examples, like Fibonacci numbers, the tower of Hanoi problem. Solving linear recurrence relation with constant coefficients using characteristic equation roots method.

UNIT III: Elementary Graph Theory:

Basic terminologies of graphs, connected and disconnected graphs, subgraph, paths and cycles, complete graphs, digraphs, weighted graphs, Euler and Hamiltonian graphs.

Trees, properties of trees, concept of spanning tree. Planar graphs. Definitions and basic results on the topics mentioned.

UNIT IV: Matrix Algebra:

Types of matrices, algebra of matrices—addition, subtraction, and multiplication of matrices, determinant of a matrix, symmetric and skew-symmetric matrices, orthogonal matrix, rank of a matrix, inverse of a matrix, applications of matrices to solve system of linear equations, Eigen values and Eigen vectors, Caley-Hamilton theorem.

Text Books

1. Garg, Reena, Engineering Mathematics, Khanna Book Publishing Company, 2024. (AICTE Recommended Textbook)
2. Garg, Reena, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2023.

3. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
4. Deo Narsingh, Graph Theory with Application to Engineering and Computer Science, Prentice Hall, India, 1979.
5. Vasishtha A.R. and Vasishtha A.K., Matrices, Krishna Prakashan, 2022.

Reference Books

1. Grimaldi Ralph P. and Ramana B. V., Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education, 2007.
2. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
3. West Douglas B., Introduction to Graph Theory, Second Edition, Pearson Education, 2015

Web Resources

1. <https://nptel.ac.in/courses/106103205>
2. <https://nptel.ac.in/courses/111101115>

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	SEC101					
Paper Name:	Problem Solving Techniques	ESE*	ISE*	Total	3/4	3
Paper Code:	BCASE111	60	40	100		

Course Objectives

CO1: Understand basic terminology of computers, problem solving, programming Languages and their evolution (Understand)

CO2: Create specification from problem requirements by asking questions to disambiguate the requirement statement.(Create)

CO3: 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). (Create)

CO4: Translate an algorithm into a C computer program (Create)

CO5: Testing and analyzing programs using debugging tools. (Analyze)

UNIT I: (CO-1, CO-2)

Problems And Problem Instances, Generalization and Special Cases, Types of Computational Problems, Classification of Problems, Analysis of Problems, Solution Approaches, Algorithm Development, Analysis of Algorithm, Efficiency, Correctness, Role of Data Structures in Problem Solving, Problem-Solving Steps (Understand the Problem, Plan, Execute, And Review), Breaking the Problem into Sub-problems, Input/Output Specification, Input Validation, Pre and Post Conditions.

UNIT II:(CO-2,CO-3, CO-4)

Structured Programming Concepts: Sequence (Input /Output/Assignment), Selection (If,If-Else) And Repetition (For, While, Do-While) Statements, Control Structure Stacking and Nesting.

Different Kinds of Repetitions: Entry Controlled, Exit Controlled, Counter Controlled, Definite, Indefinite and Sentinel-Controlled Repetitions. Pseudocode and Flowcharts. Definition And Characteristics of Algorithms, Standard Algorithm Format. Problems Involving Iteration and Nesting: Displaying Different Patterns and Shapes Using Symbols and Numbers, Generating Arithmetic and Geometric Progression, Fibonacci and Other Sequences, Approximate Values For π , $\sin(x)$, $\cos(x)$, Etc. Using Taylor Series. Different Kinds of Data in The Real World and How They are Represented in The Computer Memory. Representation of Integers: Signed Magnitude Form, 1's Complement And 2's Complement. Representation of Real Numbers: IEEE 754 Floating Point Representation. Representation of Characters: ASCII, UNICODE.

C Language: Introduction To Programming Languages, Different Generations of Programming Languages. Typed Vs Type less Programming Languages, History of C Language, An Empty C Program. C Language Counterparts For Input (scanf()), Output (printf()) Statements, Assignment, Arithmetic, Relational and Logical Operators. If, If-Else Statements, For, While, Do-While Statements. Data Types. Translating Pseudocode/Algorithm to C Program. Incremental Compilation and Testing of The C Program. Simple Problems Involving Input, Output, Assignment Statement, Selection and Repetition. Good Coding Practices.

UNIT III:(CO-2,CO-3,CO-4)

Problems on Numbers: Extracting Digits of a Number (Left to Right and Right to Left), Palindrome, Prime Number, Prime Factors, Amicable Number, Perfect Number, Armstrong Number, Factorial, Converting Number from One Base to Another. Statistics (Maximum, Minimum, Sum and Average) on a Sequence of Numbers which are Read using Sentinel- Controlled Repetition using only a few Variables.

C Language: else-if Ladder, switch Case, Increment/Decrement Operators, break and continue Statements.

UNIT IV:(CO-2,CO-3, CO-4,CO-5)

Modular Programming, Top-Down and Bottom-Up Approaches to Problem Solving. Recursion. Problems on Arrays: Reading and Writing of Array Elements, Maximum, Minimum, Sum, Average, Median and Mode. Sequential And Binary Search. Any one Sorting Algorithm. Matrix Operations.

C Language: Function Definition and Declaration (Prototype), Role of Return Statement, One Dimensional and Two-Dimensional Arrays. String Functions. Other Operators, Operator Precedence and Associativity. Debugging.

Text Books

1. [Venkatesh](#), NagarajuY, Practical C Programming for Problem Solving, KhannaBook Publishing Company, 2024.
2. AICTE's Programming for Problem Solving (with Lab Manual), Khanna Book Publishing Company, 2024.
3. Harvey Deitel and Paul Deitel, C HowtoProgram,9thedition,Pearson India,2015.
4. R G Dromey, How to Solve It by Computer.

Reference Books

1. Brian W.Kernighan and Dennis Ritchie, The C Programming Language, 2nd edition, Pearson, 2015.
2. Jeri Hanly and Elliot Koffman, Problem Solving and Program Design in C, 8th edition, Pearson, 2015.

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CC102					
Paper Name:	Computer Architecture	ESE*	ISE*	Total	3/4	3
Paper Code:	BCACC112	60	40	100		

Course Objectives

C01: To understand the basics of Digital Electronics and Binary Number System

C02: To learn the implementation of Combinational Circuit.

C03: To Learn the implementation of Sequential Circuit.

C04: To Understand the Organization of basic computers.

C05: To Understand the concept of Parallel Processing.

C06: To understand the concept of memory organization.

UNIT-I

Digital Principles: Definition for Digital signals, Digital logic, Digital computers, Von Neumann Architecture, Boolean Laws and Theorems, K-Map: Truth Tables to K-Map, 2 , 3 and 4 variable K Map, K-Map Simplifications, Don't Care Conditions, SOP and POS.

Number Systems: Decimal, Binary, Octal, Hexadecimal, Number System Conversions, Binary Arithmetic, Addition and subtraction of BCD, Octal Arithmetic, Hexadecimal Arithmetic, Binary Codes, Decimal Codes, Error detecting and correcting codes, ASCII, EBCDIC, Excess-3 Code, The Gray Code.

UNIT-II

Combinational Circuits: Half Adder and Full Adder, Subtractor, Decoders, Encoder, Multiplexer, De-multiplexer

Sequential Circuits: Flip-Flops- SR Flip- Flop, D Flip-Flop, J-K Flip-Flop, T Flip-Flop.

Register: 4 bit register with parallel load, Shift Registers-Bidirectional shift register with parallel load

Binary Counters- 4 bit synchronous and Asynchronous binary counter.

UNIT-III

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulatorlogic.CentralProcessingUnit:Introduction,GeneralRegisterOrganization,Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), RISC Vs CISC.

UNIT-IV

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input-Output Processor (IOP).

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Text Books:

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

Reference Books:

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

Suggestive Laboratory Experiments:

1. Verify logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates.
2. To study and verify NAND as a Universal Gate
3. To verify De-Morgan’s theorem for 2 variables
4. Design and test of an S-R flip-flop using NAND/NOR gate.
5. Convert BCD to Excess-3 code using NAND gate
6. To Convert Binary to Grey Code
7. Verification of Truth Tables of J-K Flip-Flop using NAND/NOR gate
8. Realize Decoder and Encoder circuit using Basic Gates.
9. Design and implement the 4:1 MUX using gates.
10. Implementation of 4-Bit Parallel Adder Using 7483 IC.
11. Design and verify operation of half adder and full adder.
12. Design and verify operation of half subtractor.
13. Design and Implement a 4bit shift register using Flip flops.
14. Implement Boolean function using logic gates in both SOP and POS
15. Design and Implement a 4bit synchronous counter.
16. Design and verify 4bit asynchronous counter.

Hardware

1. Familiarize the computer system layout: marking positions of SMPS, motherboard, FDD, HDD, CD, DVD and add on cards.
2. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/64 bit)
3. Identify and Troubleshoot the problems of RAM, SMPS and motherboard
4. Configure BIOS settings- disable and enable USB and LAN
5. Adding additional RAM to the system. (expanding RAM size).
6. To Study motherboard layout of a system.
7. Demonstrate the assembly of a PC
8. Demonstration of various ports: CPU, VGA port, PS/2 (keyboard, mouse), USB, LAN, Speaker, Audio.
9. Install and configure windows OS To study the installation of Printer and troubleshooting

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	AEC101					
Paper Name:	General English - I	ESE*	ISE*	Total	1/0	3
Paper Code:	BCAAE111	60	40	100		

Course Objective:

CO1: To provide learning environment to practice listening, speaking, reading and writing skills.

CO2: To assist the students to carry on the tasks and activities through guided instructions and materials.

CO3: To effectively integrate English language learning with employability skills and training.

CO4: To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

Unit-I: Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

Unit-II: Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

Unit-III: Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies

Unit-IV: Nature and Style of sensible Writing

Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion, Module V: Writing Practices, Comprehension, Précis Writing, Essay Writing

Unit-V: Oral Communication

(This Module involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Unit- VI: Oral Communication

(This Module involves interactive practice sessions in Language Lab)

Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

Text/Reference Books:

1. AICTE's Prescribed Textbook: Communication Skills in English (with Lab Manual), Anjana Tiwari, Khanna Book Publishing Co., 2023.
2. Effective Communication Skills. KulBhushan Kumar, Khanna Book Publishing, 2022.
3. Practical English Usage. Michael Swan. OUP. 1995.
4. Remedial English Grammar. F. T. Wood. Macmillan. 2007
5. On Writing Well. William Zinsser. Harper Resource Book. 2001
6. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011. 8. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	MDE101					
Paper Name:	Indian Knowledge System Indian Science, Engineering and Technology (Past, Present and Future)	ESE*	ISE*	Total	2/0	2
Paper Code:	BCAMD111	60	40	100		

Course Objectives

CO1: To familiarize learners with major sequential development in Indian science, engineering and technology.

CO2: To review & strengthen the ancient discovery and research in physics, chemistry, maths, metallurgy, astronomy, architecture, textile, transport, agriculture and Ayurveda etc.

CO3: To help students to trace, identify and develop the ancient knowledge systems to make meaningful contribution to development of science today

CO4: To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the scientific, technological and holistic development of physical, mental and spiritual wellbeing.

Module 1: Indian Traditional Knowledge; Science and Practices

Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & coevolution.

Traditional agricultural practices, Traditional water-harvesting practices, Traditional Livestock and veterinary Sciences Traditional Houses & villages, Traditional Forecasting, Traditional Ayurveda & plant based medicine, Traditional writing Technology

Module 2: Ancient Indian Science (Physics, Chemistry, Maths)

Physics in India: Vaisheshika darshan Atomic theory & law of motion, theory of panchmahabhoota, Brihath Shathaka (divisions of the time, unit of distance), bhaskaracharya (theory of gravity, surya siddhanta & sidhanta shriomani), Lilavati (gurutvakashan Shakti).

Chemistry in India Vatsyayana, Nagarjuna, Khanda, Al-Biruni, Vagbhaṭa – building of the ras-shala (laboratory), working arrangements of ras-shala, material and equipment, Yaśodhara Bhaṭṭa-process of distillation, apparatus, saranasamskara, saranataila

Mathematics in India: Baudhayana's Sulbasutras, Aryabhata, Bhaskaracharya- I, Severus Sebokht, Syria, Brahmagupta, Bhaskaracharya-II, Jyeshthadeva

Module 3: Ancient Indian Science (metallurgy, Astronomy, Architecture)

Metallurgy in India: Survarṇa(gold) and its different types, prosperities, Rajata(silver), Tamra(copper), Loha(iron), Vanga(tin), Naga / sisa(lead), Pittala(brass)

Astronomy in India Vedang Jyotish, aryabhata siddhanta, Mahabhaskriya, Laghubhaskariya, vatesvarasiddhanta, Sisyadhivrdhida, Grahashyay, Goladhyaya, Karabakutuhala (Aryabhata, Varahamihira, Brahmagupta, Vaṭesvara, Bhaskara, Paramesvara, NilakanṭhaSomayaji, Jyeshthadeva, ŚankaraVarman)

Architecture in India: Nagara (northern style), Vesara (mixed style), and Dravida (southern style), Indian vernacular architecture, Temple style, cave architecture, rock cut architecture, Kalinga architecture, Chandela architecture, Rajput architecture, Jain architecture, Sikh architecture, Maratha architecture, Indo-Islamic architectural, Indo-Saracenic revival architecture, Greco-Buddhist style.

Module 4: Ancient Indian Science (Textile, Agriculture, Transport)

Textile Technology in India: Cotton (natural cellulose fiber), silk, wool (natural protein fibers), bast and leaf fibers, mridhuhautadhupitambaram (meaning a practice of fumigating the fabric with incense smoke before use as a part of the finishing process), sitadhautavasanaayugala (bleached white—a finishing process); suchhastah, sutradharah (needle and thread – tools for stitching).

Dyeing, washing spinning and weaving technology, Agriculture in India: Krishisuktas, Krishiparashara, Brihatsamhita, Types of crops, Manures, Types of land- devamatruka, nadimatruka, use of animals in warfare, animal husbandry, Animals for medicines. Ancient transport in India

Module 5: Ancient Indian Science (Ayurveda & Yoga)

Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha bhuta, the communication between body & mind, health regimen for wellbeing, introduction to yoga (raja yoga, astanga yoga, gyan yoga), understanding of Indian psychological concept, consciousness, tridosha & triguna.

References:

1. Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
2. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
3. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
4. SK Das, The education system of Ancient hindus, Gyan publication house, India
5. R P Kulkarni, Glimpse of Indian Engineering and Technology (Ancient & Medieval period, Munshiram Manoharlal Publishers Pvt. Ltd. 2018)
6. AK Pathak, Science and Technology in India, Anshika prakashan pratapgarh, 2016
7. PB Sharma, S. Narain, Doctors Scientists and Engineers of Ancient India, Kalpaz Publications 2017
8. NVP, Unithiri, Indian Scientific Traditions (Professor K.N. Neelakantan Elayath Felicitation Volume), publication division unieristy of Calicut, 2006
9. Anonyms, History of Science in India- Volume-I Part-I (Physics, Mathematics and Statistics), the national academy of science, India & the ramkrishna mission institute of culture, 2014
10. R N Basu, T K Bose, CS, Cakraborty History of Science in India – Agricultural Science (Volume V), the national academy of science, India & the ramkrishna mission institute of culture 2014
11. A Gosh, History of Science in India (Volume-I Part-II Astronomy), the national academy of science, India & the ramkrishna mission institute of culture, 2014
12. Dharmpal, Indian science and technology in the eighteen century, rashtrottahana sahitya, 1983
13. S Biswal, B L ray, vedic Science and technology, DK Print world, 2009
14. A.K Bag, Histroy of technology in Indian (Set 3 vol), Indian Nation Science Academy, 1997.
15. AR vasudev Murty, Science and Technology in Ancient India as Reflected in the Mahabharata, Sanskrit bharati, 2019

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	VAC101					
Paper Name:	Environmental Science and Sustainability	ESE*	ISE*	Total	2/0	2
Paper Code:	BCAVA111	60	40	100		

Course Outcome(s):

CO1: Explore the basic environmental concepts and issues relevant to the business and management field.

CO2: Recognize the interdependence between environmental processes and socio-economic dynamics.

CO3: Determine the role of business decisions, policies, and actions in minimizing environmental degradation.

CO4: Identify possible solutions to curb environmental problems caused by managerial actions.

CO5: Develop skills to address immediate environmental concerns through changes in business operations, policies, and decisions.

Unit1: 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 inter generational equity, and the importance of public awareness and education.

Unit2: Ecosystems, Biodiversity, and Sustainable Practices

Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the there at sit faces, and theme thods 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.

Unit 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.

Unit4: 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 their settlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.

Text Books (Latest Editions):

1. Poonia, M.P. *Environmental Studies* (3rd ed.), Khanna Book Publishing Co.
2. Bharucha, E. *Textbook of Environmental Studies* (3rd ed.) Orient Black swan Private Ltd.
3. Dave, D., & Katewa, S.S. *Text Book of Environmental Studies*. Cengage Learning India Pvt Ltd.
4. Rajagopalan, R. *Environmental studies: from crisis to cure* (4th ed.). Oxford University Press.
5. Miller, G.T. & Spoolman S. *Living in the Environment*. (20th ed.). Cengage.
6. Basu, M., & Xavier Savarimuthu, S. J. *Fundamentals of environmental studies*. Cambridge University Press.
7. Roy, M.G. *Sustainable Development: Environment, Energy and Water Resources*. Ane Books.
8. Pritwani, K. *Sustainability of business in the context of environmental management*. CRC Press.
9. Wright, R.T. & Boorse, D.F. *Environmental Science: Toward A Sustainable Future* (13th ed.). Pearson.

References Web links:

1. <https://www.ourplanet.com>
2. <https://www.undp.org/content/undp/en/home/sustainable-development-goals.html>
3. www.myfootprint.org
4. <https://www.globalchange.umich.edu/globalchange1/current/lectures/king/ecosystem/ecosystem.html>

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	AEC102					
Paper Name:	Sanskrit – I	ESE*	ISE*	Total	1/0	0
Paper Code:	BCAAE112	60	40	100		

- 1) Alphabets – □□□□□□□□ Vowels, Consonants, Consonants with vowels, Conjunct consonants
- 2) Words – □□□□□□ - Masculine Nouns, Feminine Nouns, Neuter Nouns
- 3) Indeclinable : □□□□□□□□ Numbers, cases and genders
- 4) Verbs and Tenses - □□□□□□□□□□□□ □□□□□□□□ (1) parasmaipada (2) ātmanepada and (3) ubhayapada
- 5) Person & Number:- (1)Third person, (2) Second person and (3) First person
Singular (2) Dual and (3) Plural
- 6) Simple Sentences – □□□□□□□□□□□□
- 7) Words & Cases : □□□□ □□□ □□□□□□□ Masculine Nouns , Feminine, Neuter Nouns
- 8) Prefixes – □□□□□□□□□□ indeclinable, imperfect verb, definite verb, past tense of verb, present continuous tense
- 9) Suffixes –□□□□□□□□□□
- 10) Numerals- □□□□□□□□ – 1-100
- 11) Voice –Active : Voice, Passive Voice
- 12) Combination- svara-sandhi, vyaijana-sandhi, visarga-sandhi
- 13) Scriptures –Shlokas

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CS111					
Paper Name:	Basic of Web Programming	ESE*	ISE*	Total	1/2	2
Paper Code:	BCACS111	60	40	100		

Unit 1: Overview of HTML & HTML5 & CSS

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. Requirement for Internet

Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Creating and opening HTML file

Singular and paired tags, Text form Lists, Image, Image Map, Table, Paragraph Tags.

Overview of basic HTML5

Structure of HTML5 DOCTYPE Element

Graphics and Media tags in HTML5

Lists in HTML, Introduction to DIV tag, NAVBAR Design.

Tags-Section, Article, aside, header, footer etc.

Input tag - (Type, Auto focus, placeholder, required etc. attributes.) : Form, get and post method TABLE, FORM, TEXTAREA, SELECT, IMG, IFRAME

FIELDSET, ANCHOR.

Unit 2: Use of CSS

Introduction to CSS

Types of CSS, Selectors, Properties, Values.

CSS Properties- Background, Text, Fonts, Link, List, Table, Box Model, Border, Margin,

Padding, Display, Positioning, Floating, Opacity, Media type, Backgrounds and Borders Image, Values and Replaced Content, Text Effects, 2D/3D Transformations, Animations, Multiple Column Layout

User Interface

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	I	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CS112					
Paper Name:	Wordpress	ESE*	ISE*	Total	0/2	1
Paper Code:	BCACS112	60	40	100		

Unit 1: Overview of HTML & HTML5 & CSS

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. Requirement for Internet

Introduction to HTML, history of HTML, Objective, basic Structures of HTML, Header Tags, body tags, Creating and opening HTML file

Singular and paired tags, Text form Lists, Image, Image Map, Table, Paragraph Tags.

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FIELDSET, ANCHOR.

Unit 2: Use of CSS

Introduction to CSS

Types of CSS, Selectors, Properties, Values.

CSS Properties- Background, Text, Fonts, Link, List, Table, Box Model, Border, Margin,

Padding, Display, Positioning, Floating, Opacity, Media type, Backgrounds and Borders Image, Values and Replaced Content, Text Effects, 2D/3D Transformations, Animations, Multiple Column Layout

User Interface

Problem Solving Techniques: Lab Problems

UNIT-II

1. Converting degrees Celsius to Fahrenheit and vice versa?
2. Display three input numbers in sorted (non-decreasing) order?
3. Given a positive integer value n ($n \geq 0$) display number, square and cube of numbers from 1 to n in a tabular format?
4. Given an input positive integer number, display odd numbers from in the range $[1, n]$?
5. Display first mathematical tables, each table up to 10 rows? Generalise this to display first n ($n > 0$) mathematical tables up to m ($m > 0$) rows?
6. Display following patterns of n rows ($n > 0$), For the below examples $n = 5$? For each pattern write a separate algorithm/program?

\$ \$\$ \$\$\$ \$\$\$\$ \$\$\$\$\$	12345 1234 123 12 1	\$ \$\$ \$\$\$ \$\$\$\$ \$\$\$\$\$	12345 1234 123 12 1
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7. Display the following patterns of n rows ($n > 0$), for the below examples $n = 5$?

Hollow square #	Triangle pattern with numbers: 1 121 12321 1234321	Diamond Pattern * *** ***** *** *	Square with diagonals ***** ** * * * * * * * * * * *****
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8. Given the first term (a), difference/multiplier (d) and number of terms ($n > 0$), display the first n terms of the arithmetic/geometric progression?
9. Display the first n ($n > 0$) terms of the fibonacci sequence?
10. Display the first n ($n > 0$) terms of the Tribonacci sequence?
11. Given two positive integer numbers $n1$ and $n2$ check if the numbers are consecutive numbers of the fibonacci sequence?
12. Compute approximate value of π considering first n ($n > 0$) terms of the Taylor series for π ?
13. Compute approximate value of e^x considering first n ($n > 0$) terms of the Taylor series for e^x ?
14. Compute approximate value of $\sin(x)/\cos(x)$ considering first n ($n > 0$) terms of the Taylor series for $\sin(x)/\cos(x)$?

UNIT-III

1. Extract digits of an integer number (left to right and right to left)?
2. Given a sequence of digits form the number composed of the digits. Use sentinel controlled repetition to read the digits followed by -1. For example, for the input 2 7 3 2 9 -1 the output number is 27329?
3. Check if a given positive integer number is a palindrome or not?
4. Compute character grade from the marks ($0 \leq \text{marks} \leq 100$) 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?
5. Compute the sum of a sequence of numbers entered using sentinel controlled repetition?
6. Check if a given positive integer number is a prime number or not?
7. Compute prime factors of a positive integer number?
8. Check if two positive integer numbers are amicable numbers or not?

9. Check if a given positive integer number is a perfect number or not?
10. Check if a given positive integer number Armstrong number or not?
11. Converting a positive integer number ($n > 0$) from one base (inputBase) to another base (outputBase) ($2 \leq \text{input Base}, \text{outputBase} \leq 10$). Input number should be validated before converting to make sure the number uses only digits allowed in the input base?
12. Write a program to display a number in text form. For example If the number is 5432 the output should be "FIVE FOUR THREE TWO"?
13. Using the grading scheme described in the question 4 (UNIT III), Compute how many students awarded each grade and display the frequency as a bar chart (horizontal) using single "*" for each student. Use sentinel controlled repetition (-1 as sentinel value) in reading the students marks. Use else-if ladder/switch case to compute the grade and the corresponding frequency.
Sample bar chart when the class has 7-A, 10-B, 3-C, 7-D and 1-F grades.

A:

B:

C: ***

D:

F: *

14. Compute maximum, minimum, sum and average of a sequence of numbers which are read using sentinel controlled repetition using only few variables?
15. Compute body mass index, $BMI = \text{weightinKGs} / (\text{HeightinMeters} * \text{HeightinMeters})$, Both weight and height values are positive real numbers. Your program should display BMI value followed by whether the person is Underweight, Normal, Overweight or Obese using the below ranges:

BMI Values

Underweight: less than 18.5

Normal: ≥ 18.5 and < 25

Overweight: ≥ 25 and < 30

Obese: ≥ 30

UNIT IV

1. Design a modularized algorithm/program to check if a given positive integer number is a circular prime or not?
2. Design a modularized algorithm/program to compute a maximum of 8 numbers?
3. Design a modular algorithm/program which reads an array of n integer elements and outputs mean (average), range (max-min) and mode (most frequent elements)?
4. Design a modular algorithm/program which reads an array of n integer elements and outputs median?
5. Implement your own string length and string reversal functions?
6. Design algorithm/program to perform matrix operations addition, subtraction and transpose?
7. Write a recursive program to count the number of digits of a positive integer number?
8. Recursive solutions for the following problems:
 - a. Factorial of a number?
 - b. Display digits of a number from left to right (and right to left)?
 - c. Compute xy using only multiplication?
 - d. To print a sequence of numbers entered using sentinel controlled repetition in reverse order?

SEMESTER -II

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CC103					
Paper Name:	Mathematics Foundation II	ESE*	ISE*	Total	3/0	3
Paper Code:	BCACC121	60	40	100		

Course Objectives:

CO1: This course helps the students to understand correct lines of arguments and proofs.

CO2: This course introduces mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.

CO3: This course helps the students to understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science.

UNIT-I: Logic and Methods of Proofs:

Propositions, logical operations (basic connectives), compound statements, construction of truth table, quantifiers, conditional statements, tautology, contradiction, contingency, logical equivalence. Conjunctive Normal Forms (CNF) and Disjunctive Normal Forms (DNF).

Methods of proofs: Rules of inference for propositional logic, modus ponens, modus tollens, syllogism, proof by contradiction, Mathematical Induction.

UNIT-II: Algebraic Structures:

Semi-group, Monoid, Group, Subgroup, Cyclic group.

UNIT-III: 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

Only formula and problem solving for all the topics mentioned above.

UNIT-IV: Optimization Techniques:

Linear programming: Introduction, L P formulation, Graphical method for solving L P with two variables, Special cases in graphical methods, Simplex method, Duality.

Transportation problem: Definition, Linear form, North-west corner method, Least cost method, Vogel's approximation method for finding feasible solution, MOD I method for finding optimum solution.

Text Books

1. Kolman B., Busby R. and Ross S., Discrete Mathematical Structures, 6th Edition, Pearson Education, 2015.
2. Sastry S.S., Introductory Methods of Numerical Analysis, Fifth Edition, PHL, 2022.

3. Taha Hamdy A., Operations Research: An Introduction, Eighth Edition, Pearson Prentice Hall, 2003.
4. S.B.Singh, Discrete Structures, Khanna Book Publishing, 2023(AICTE Recommended Textbook)

Reference Books

1. Rosen Kenneth H. and Krithivasan Kamala, Discrete Mathematics and its Applications, McGraw Hill, India, 2019.
2. Chakravorty J.G. and Ghosh P.R., Linear Programming and Game Theory, Moulik Library, 2017.
3. Sharma J.K., Operations Research: Theory and Applications, Fourth Edition, Macmillan Publishers, 2007.

Web Resources

1. <https://nptel.ac.in/courses/111107127>
2. <https://www.math.iitb.ac.in/~siva/si50716/SI507lecturenotes.pdf>

Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CC104					
Paper Name:	Data Structure	ESE*	ISE*	Total	3/4	5
Paper Code:	BCACC122	60	40	100		

Course Objectives

CO1: Understand the fundamental concepts of Data Structures and their applications.

CO2: Develop problem-solving skills using Data Structures.

CO3: Implement Data Structures using C programming language.

UNIT-I:

Introduction and Overview: Definition, Classification and Operations of Data Structures.

Algorithms: Complexity, Time-Space Tradeoff.

Arrays: Definition and Classification of Arrays, Representation of Linear Arrays in Memory, Operation 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.

UNIT-II:

Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists, Traversing, Inserting, Deleting and Searching in Singly Linked List, Doubly Linked List and Circular Linked List. Applications of Linked Lists: Addition of Polynomials.

Hashing and Collision: Hashing, Hash Tables, Types of Hash Functions, Collision, Collision Resolution with Open Addressing and Chaining.

UNIT-III:

Stacks: Definition, Representation of Stacks using Arrays and Linked List, Operations on Stacks using Arrays and Linked List, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression.

Recursion: 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.

UNITIV:

Graphs: 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.

Text Books

1. R.B. Patel, "Expert Data Structures with C", Khanna Book Publishing Company, 2023 (AICTE Recommended Textbook)
2. Seymour Lipschutz, "Data Structures with C", Schaum's Outlines, Tata McGraw-Hill, 2011.
3. Yashavant Kanetkar, "Data Structures Through C", 4th Edition, BPB Publications, 022.

Reference Books

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

Web Resources

1. Geeks for Geeks-Data Structures Tutorial
2. Khan Academy-[Algorithms Course](#)

Lab Programs:

1. Write a program for insertion and deletion operations in an array.
2. Write a program to search for an element in an array using Linear Search and Binary Search.
3. Write a program to sort an array using Bubble Sort, Selection Sort and Insertion Sort.
4. Write a program to merge two arrays.
5. Write a program to add and subtract two matrices.
6. Write a program to multiply two matrices.
7. 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
8. Write a program to delete an element from a Singly Linked List:
 - (a) At the beginning
 - (b) At the end
 - (c) A specified element
9. 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 the following operations in a Circular Linked List:
 - (a) Create
 - (b) Delete an element from the end
11. Write a program to implement stack operations using an array.
12. Write a program to implement stack operations using a linked list.
13. Write a program to add two polynomials using a linked lists.
14. Write a program to evaluate a postfix expression using a stack.
15. Write a program to perform the following using recursion:
 - (a) Find the factorial of a number
 - (b) Find the GCD of two numbers
 - (c) Solve Towers of Hanoi problem
16. Write a program to implement simple queue operations using an array.
17. Write a program to implement circular queue operations using an array.
18. Write a program to implement circular queue operations using a linked list.
19. Write a program to perform the following operations on a binary search tree.
 - (a) Pre order Traversal
 - (b) In order Traversal
 - (c) Post order Traversal
20. Write a program to perform insertion operation in a binary search tree.

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CC105					
Paper Name:	Operating System	ESE*	ISE*	Total	3/2	4
Paper Code:	BCACC123	60	40	100		

Course Outcomes(COs):

CO1: Explain the fundamentals of the operating system.

CO2: Comprehend multithreaded programming, CPU scheduling, process management, process synchronization, memory, deadlocks, and storage management.

CO3: Compare the performance of CPU scheduling algorithms

CO4: Identify the features of I/O and File handling methods.

UNIT-I:

Operating Systems Overview: Definition, Evaluation of O.S, Components & Services of OS, Structure, Architecture, types of Operating Systems, Batch Systems, Concepts of Multiprogramming and Time Sharing, Parallel, Distributed and real time Systems.

Operating Systems Structures: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT-II:

Process Management: Process Definition, Process states, Process State transitions, Process Scheduling, Process Control Block, Threads, Concept of multithreads, Benefits of threads, Types of threads.

Process Scheduling: Definition, Scheduling objectives, Scheduling algorithms, CPU scheduling Preemptive and Non-preemptive Scheduling algorithms (FCFS, SJF and RR), Performance evaluation of the scheduling Algorithms

UNIT-III:

Process Synchronization: Introduction, Inter-process Communication, Race Conditions, Critical Section Problem, Mutual Exclusion, Semaphores, Monitors.

Deadlocks: System model, deadlock characterization, deadlock prevention, avoidance, Banker's algorithm, Deadlock detection, and recovery from deadlocks.

UNIT-IV:

Memory Management: Logical and Physical address map, Swapping, Memory allocation, MFT, MVT, Internal and External fragmentation and Compaction, Paging, Segmentation.

Virtual Memory: Demand paging, Page Replacement algorithms, Allocation of frames, thrashing.

I/O Management: Principles of I/O Hardware: Disk structure, Disk scheduling algorithms.

Text Books:

1. Ekta Walia, Operating Systems Concepts, Khanna Publishing House, 2022 (AICTE Recommended Textbook)
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition OR Later edition, Wiley India Private Limited, New Delhi.
3. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

Reference Books:

1. Andrew S Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall India.
2. Sumitabha Das, UNIX Concepts and Applications, 4th Edition, Tata McGraw-Hill.

Operating Systems LAB

List of experiments

1. Write a C program to simulate the FCFS CPU Scheduling algorithm.
2. Write a C program to simulate the SJF CPU Scheduling algorithm.
3. Write a C program to simulate the Round Robin CPU Scheduling algorithm.
4. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance.
5. Write a C program to implement the Producer-Consumer problem using semaphores.
6. Write a C program to illustrate the IPC mechanism using Pipes.
7. Write a C program to illustrate the IPC mechanism using FIFOs.
8. Write a C program to simulate Paging memory management technique.
9. Write a C program to simulate Segmentation memory management technique.
10. Write a C program to simulate the Best Fit contiguous memory allocation technique.
11. Write a C program to simulate the First Fit contiguous memory allocation technique.
12. Write a C program to simulate the concept of Dining-Philosophers problem.
13. Write a C program to simulate the MVT algorithm.
14. Write a C program to implement FIFO page replacement technique.
15. Write a C program for implementing sequential file allocation method.

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	SEC102					
Paper Name:	Object Oriented Programming Using Java	ESE*	ISE*	Total	3/4	5
Paper Code:	BCASE121	60	40	100		

Course Objectives

CO1: To introduce the object oriented programming system concepts
CO2: To introduce syntax and semantics of Java programming language

CO3: To develop modular programs using Java

CO4: To setup JDK environment to create, debug and run Java programs
 Prerequisite: Knowledge of Problem Solving Techniques using C programming language

UNIT-I:

Fundamentals of Object Oriented Programming: Basic Concepts of Object Oriented Programming (OOP), Benefits and Applications of OOP.

Java Evolution: Java Features, Difference between Java, C and C++, Java and Internet, Java Environment.

Overview of Java Language: Introduction to Simple Java Program, Use of Comments and Math function, Application of two classes, Java Program Structure, Java Tokens and statements, Implementing Java program And JVM, Command Line Arguments.

TextBook1:Chapters1, 2 and 3.

UNIT-II:

Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Typecasting.

Operators & Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, Increment & Decrement operators, conditional operators, Bitwise operators, Arithmetic Expressions, Evaluation of Expressions, Type Conversions in Expressions, Operator Precedence & Associativity.

Decision Making, Branching & Looping: Decision Making with Control Statements, Looping statements, Jump in loops, Labelled loops.

UNIT-III:

Classes, Objects and Methods: Defining Class, Methods Declaration, Constructors, Methods Overloading, Overriding Methods, Inheritance

Arrays, Strings and Vectors: 1D arrays, Creating an Array, 2D arrays, Strings, Vectors, Wrapper Classes, Enumerated Types

Inheritance: Defining, extending classes, and Implementing Interfaces. Multiple inheritance and polymorphism.

UNIT-IV:

Packages: Basics of packages, System packages, Creating and accessing packages, Creating User defined packages, Adding class to a package.

Exception Handling: Using the main keywords of exception handling: try, catch, throw, throws and finally; Nested try, Multiple catch statements, Creating user defined exceptions.

UNIT V:

Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, deadlocks.

I/O Streams: Streams, Byte streams, Character streams, File class, FileStreams

Event Programming: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Layout Manager, Menu, Menu bar, Adapter classes / Listeners

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

Text Books

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

Reference Books

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

Web Resources

1. <https://www.w3schools.com/java/>.
2. <http://www.java2s.com/>.
3. https://onlinecourses.nptel.ac.in/noc22_cs47/preview

List of Practical:

1. Write a program to read two numbers from user and print their product.
2. Write a program to print the square of a number passed through command line arguments.
3. Write a program to send the name and surname of a student through command line arguments and print a welcome message for the student.
4. Write a java program to find the largest number out of n natural numbers.
5. Write a java program to find the Fibonacci series & Factorial of a number using recursive and non recursive functions.
6. Write a java program to multiply two given matrices.
7. Write a Java program for sorting a given list of names in ascending order.
8. Write a Java program that checks whether a given string is a palindrome or not . Ex: MADAM is a palindrome.
9. Write a java program to read n number of values in an array and display it in reverse order.
10. Write a Java program to perform mathematical operations. Create a class called Add Sub with methods to add and subtract. Create another class called Mul Div that extends from Add Sub class to use the member data of the super class. Mul Div should have methods to multiply and divide A main function should access the methods and perform the mathematical operations.
11. Create a JAVA class called Student with the following details as variables with in 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.

12. Write a Java program that displays the number of characters, lines and words in a text.
13. Write a Java program to create a class called Shape with methods called getPerimeter() and getArea(). Create a sub class called Circle that overrides the getPerimeter() and getArea() methods to calculate the area and perimeter of a circle.
14. Write a Java program to create a class Employee with a method called calculateSalary(). Create two subclasses Manager and Programmer. In each subclass, override the calculateSalary() method to calculate and return the salary based on their specific roles.
15. Write a Java program using an interface called 'Bank' having function 'rate_of_interest()'. Implement this interface to create two separate bank classes 'SBI' and 'PNB' to print different rates of interest. Include additional member variables, constructors also in classes 'SBI' and 'PNB'.
16. Write a Java package program for the class book and then import the data from the package and display the result.
17. Write a Java program for finding the cube of a number using a package for various data types and then import it in another class and display the results.
18. Write a Java program for demonstrating the divide by zero exception handling.
19. Write a Java program that reads a list of integers from the user and throws an exception if any numbers are duplicates.

Create an exception subclass Under Age, which prints "Under Age" along with the age value when an object of Under Age class is printed in the catch statement. Write a class exception Demo in which the method test() throws Under Age exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	SEC103					
Paper Name:	Web Technology	ESE*	ISE*	Total	1/2	2
Paper Code:	BCASE102	60	40	100		

Course Objectives

CO1: To understand the concepts and architecture of the World Wide Web, Markup languages along with Cascading Style Sheets.

CO2: To understand the concepts of event handling and data validation mechanisms.

CO3: To understand the concepts of embedded dynamic scripting on client and server side Internet Programming and basic full stack web development.

CO4: To develop modern interactive web applications

Unit-I:

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.

Introduction to CSS, types, Selectors, and Responsiveness of a webpage.

Introduction to Bootstrap, downloads/linking, using classes of Bootstrap, understanding the Grid System in Bootstrap.

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.

Unit-II:

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 JavaScript. Date and String handling in JavaScript.

Manipulating CSS through JavaScript: Form Validation like Required validator, length validator, Pattern validator. Advanced JavaScript, Combining HTML, CSS and JavaScript events and buttons, controlling your browser. Introduction to AJAX, Purpose, advantages and disadvantages, AJAX based Web applications and alternatives of AJAX.

Introduction to XML: uses, Key concepts, DTD8 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

Text Books

1. Laura Lemay, Mastering HTML, CSS & JavaScript Web Publishing, BPB Publications, 2016
2. Thomas A. Powell, The Complete Reference HTML & CSS, Fifth Edition, 2017

Reference Books

1. Silvio More to, Bootstrap 4 By Example, ebook, 2016.
2. Tanweer Alam, Web Technologies, Khanna Book Publishing, 2011.

Web Resources

1. www.javatpoint.com
2. www.w3schools.com
3. <https://www.geeksforgeeks.org/web-technology/>

Practical list of Programs:

PART-A

1. Create your class time table using table tag.
2. Design a Webpage for your college containing description of courses, department, faculties, library etc. using list tags, href tags, and anchor tags.
3. Create web page using Frame with rows and columns where we will have header frame, left frame, right frame, and status bar frame. On clicking in the left frame, information should be displayed in right frame.
4. Create Your Resume using HTML, use text, link, size, color and lists.
5. Create a Web Page of a supermarket using (internal CSS)
6. Use Inline CSS to format your resume that you have created.
7. Use External CSS to format your time table created.
8. Use all the CSS (inline, internal and external) to format college webpage that you have created.
9. Write a HTML Program to create your college website using for mobile device.

PART-B

1. Write an HTML/JavaScript page to create login page with validations.
2. Develop a Simple calculator for addition, subtraction, multiplication and division operation using JavaScript.
3. Use Regular Expressions for validations in Login Page using JavaScript.
4. Write a Program to retrieve date from a text file and displaying it using AJAX.
5. Create XML file to store Student Information like Register Number, Name, Mobile Number, DOB, and Email-Id.
6. Create a DTD for (0).
7. Create XML scheme for(0).
8. Create XSL file to convert XML file to XHTML file.
9. Write a JavaScript program using Switch case.
10. Write a JavaScript program using any 5 events.
11. Write a JavaScript program using built in JavaScript objects.
12. Write program for populating values from JSON text.
13. Write a program to transform JSON text to a JavaScript object.

Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	VAC102					
Paper Name:	Indian Constitution	ESE*	ISE*	Total	2/0	2
Paper Code:	BCAVA121	60	40	100		

Course Objectives:

C01: Understand the history, evolution, and basic structure of the Indian Constitution.

C02: Analyze the structure, roles, and powers of the Union Government.

C03: Examine the functions and administration of the State Government.

C04: Understand the framework and significance of Local Administration in governance.

Unit-1: The Constitution-Introduction

The History of the Making of the Indian Constitution

Preamble and the Basic Structure, and its interpretation

Fundamental Rights and Duties and their interpretation

State Policy Principles

Unit-2: Union Government

Structure of the Indian Union

President–Role and Power

Prime Minister and Council of Ministers

Lok Sabha and Rajya Sabha

Unit-3: State Government

Governor–Role and Power

Chief Minister and Council of Ministers

State Secretariat

Unit-4: Local Administration

District Administration

Municipal Corporation

Zila Panchayat

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CS123					
Paper Name:	PowerBI	ESE*	ISE*	Total	0/2	1
Paper Code:	BCACS123	60	40	100		

Unit I: Basics of PowerBI

What is BI? BI life Cycle, PowerBI Architecture, Power BI Flow, Power BI installation, PowerBI Desktop introduction:
 Get Data, Load Excel file in Power BI , Power Query, Data Types, Column Profiling views in Power Query (column distribution, quality,profile)
 Transform and Add Column, String Function, Number functions and Date and time functions
 Transform data (replace, group by, New table), merge, append
 Transform, pivot, and unpivot, Power Pivot
 Data Modeling (Star Schema and Snow flake schema)
 Fact table and dim table, Importance of Dim Table
 Cardinality importance, Types of Cardinality, Cross filter
 Introduction to DAX, New measures, New column, New Table, Dim Date, New Table
 Aggregation and Filter Functions, Date and Time functions
 Conditional functions, and Logical Functions, Text Functions, Time Intelligence functions
 Best practices in DAX, Quick Measure, Math Functions

Unit II: Visualization with PowerBI

What is Power BI Visualization?
 Types of Visualization in Power BI?
 Cards, Slicer, Column Charts, Bar Charts, Pie Chart, Gauge Chart. Etc
 Line Chart, Area Chart, Waterfall chart Visualization skills.
 Formatting all visuals, Fields,color combinations, Data Analytics Pane, Filter Pane, RLS
 Drill Down, Drill Through create and manage hierarchy
 Map Visuals, Visual tooltips, Tooltip Page
 Understand Visuals, Custom Visuals(Advacnce Card, Tallan Calendar, Infographic, Heat Maps, Scroller)
 AI Visuals : Decomposition Tree,Smart Narrative, Q&A
 KPI Visual

Introduction to PowerBI Service

Licensing Service: Workspace, Quick insights, publishing and managing workspace
 Gateways, data lineage, auto refresh, Dataflow, Data Alerts, Subscriptions
 Resolving One to One, Understand Cross Filter direction with examples
 Many many relationship in data modelling
 Discount parameter table(using what if), Performance Analyzer
 Currency Conversion

(AICTE) NEP Curriculum : w.e.f June 2025						
Programme: BCA I						
Semester:	II	Assessment & Evaluation Pattern			L/P	Credits
Paper Category:	CS124					
Paper Name:	Mini Project	ESE*	ISE*	Total	0/2	0
Paper Code:	BCACS124	60	40	100		

Module 1: Project Topic Selection and Allocation:

- Project topic selection Process to be defined and followed:
- Project orientation can be given on start of semester
- Students can certainly take ideas from anywhere, but be sure that they should evolve them in the unique way to suit their project requirements.
- Topics can be finalized with respect to following criterion:
- Topic Selection: The topics selected should be on current requirement of society/industries (Product based, Application based or Research based) or should work towards removing currently existing systems.
- Technology Used: Use of latest technology or modern tools can be encouraged.
- Project work must be carried out by the group of at least 2 students
- Guide allocation should be done and students have to submit weekly progress report to the internal guide
- Internal guide has to keep track of the progress of the project and also has to maintain attendance report. This progress report can be used for awarding term work marks.

Module 2: Project Report Format:

- A project report should preferably contain at least following details:
- Abstract
- Introduction o Literature Survey/ Existing system
- Limitation Existing system or research gap
- Problem Statement and Objective
- Proposed System
- Analysis/Framework/ Algorithm
- Design details
- Methodology (your approach to solve the problem) Proposed System
- Experimental Set up
- Details of Database or details about input to systems or selected data
- Performance Evaluation Parameters (for Validation)
- Software and Hardware Set up