J. C. Bose University of Science and Technology, YMCA,

Faridabad, Haryana

Department of Computer Applications
(Faculty of Informatics and Computing)

Scheme and Syllabus
As per AICTE Modal Curriculum

BCA & BCA (Data Science)

(Semester I – II)

w.e.f. 2025

(Scheme & Syllabus Proposed and Approved in 9th BOS held on 18.03.25)

Scheme

(Semester I & II)

BCA & BCA (DS)-1 Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hr			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
3 Weeks Compulsory Induction Program(UHV-1)										
1	Discipline Specific-Major	BCG-101-V1	Mathematics Foundations to Computer Science – I	3	0	3	25	75	100	3
2	Skill Enhancement Course	BCG-103-V1	Problem Solving Techniques	3	0	3	25	75	100	3
3	Discipline Specific-Major	BCG-105-V1	Computer Architecture	3	0	3	25	75	100	3
4	Value Added Course	VAC-104-V1	Indian Knowledge System	2	0	2	25	75	100	2
5	Ability Enhancement course	AEC-105-V1	General English - I	2	0	2	25	75	100	2
6	Value Added Course	VAC-101-V	Environmental Science and sustainability	2	0	2	25	75	100	2
7	Ability Enhancement course		Ability Enhancement Elective-1	2	0	2	25	75	100	0
8	Skill Enhancement Course	BCG-107-V1	Problem Solving Techniques-Lab	0	4	4	15	35	50	2
9	Skill Enhancement Course	BCG-109-V1	Computer Architecture-Lab	0	4	4	15	35	50	2
Total						**25**	**205**	**595**	**800**	**19**

Ability Enhancement Elective-1

S_No.	Subject Code	Subject Name
1.	AEC-309-V	French 1
2.	AEC-307-V	German 1

BCA & BCA (DS)- II Semester

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End-Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific- Major	BCG-102-V1	Mathematics Foundations to Computer Science - II	3	-	3	25	75	100	3
2	Discipline Specific- Major	BCG-104-V1	Data Structures	3		3	25	75	100	3
3	Discipline Specific- Major	BCG-106-V1	Operating Systems	3	-	3	25	75	100	3
4	Skill Enhancement Courses	BCG-108-V1	Object Oriented Programming using Java	3	-	3	25	75	100	3
5	Skill Enhancement Courses	BCG-110-V1	Web Technologies	2	-	2	25	75	100	2
6	Value Added Course	VAC-112-V1	Indian Constitution	2	-	2	25	75	100	2
7	Ability Enhancement courses		Ability Enhancement Elective-2	2	-	2	25	75	100	0
8	Discipline Specific Lab	BCG-112-V1	Data Structure Lab	-	4	4	15	35	50	2
9	Discipline Specific Lab	BCG-114-V1	Operating Systems Lab	-	2	2	15	35	50	1
10	Skill Enhancement Courses	BCG-116-V1	Object Oriented Programming using Java Lab	-	4	4	15	35	50	2
11	Skill Enhancement Courses	BCG-118-V1	Web Technologies Lab	-	2	2	15	35	50	1
Total						**30**	**235**	**665**	**900**	**22**

Ability Enhancement Elective-2

S_No.	Subject Code	Subject Name
1.	AEC-310-V	French II
2.	AEC-308-V	German II

Exit Criteria after First Year of BCA Programme

Students will have the option to exit the Bachelor of Computer Application (BCA) program after successfully completing the first year. Upon exit, they will be awarded a **UG Certificate in Computer Application**.

The Multiple Exit Provisions are structured as follows (according to SOP for Multiple Exit Provisions for Programs Running as per NEP 2020 in UTDs and Affiliated Institutes (**No. Acad. /AC/2025/2026):**

Exit after lst Year: **Certificate (36 to 40 Credits**)- Students who opt to exit after completion of the first year will be awarded a UG certificate (level 4.5) if, in addition, they complete one vocational course of 4 credits during the summer vacation of the first year. These students are allowed to re-enter the degree program within three years and complete the degree program within the stipulated maximum period of seven years.

Exit after 2nd Year: Diploma (72 to 80 Credits) - Students who opt to exit after completion of the 2nd year will be awarded the UG diploma (level 5) if, in addition, they complete one vocational course of 4 credits during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree program within the maximum period of seven years.

SEMESTER I

BCG-101-V1
Mathematics Foundation to Computer Science - I
BCA & BCA (DS)-I Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Prerequisite: This is an introductory programming course and hence no prerequisites.

Course Objectives:

1. Provide a basic understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics.
2. This course enables the students to use mathematical models and techniques to analyze and understand problems in computer science.
3. This course demonstrates how the mathematical principles give succinct abstraction of computer science problems and help them to efficiently analyze.
4. Provide a basic understanding of fundamental mathematical concepts Such as sets functions, matrix algebra, and discrete mathematics.

Syllabus:

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.

Course Outcomes (COs) :
At the end of program the student will be able to**:**
CO1: Demonstrate a clear understanding of fundamental mathematical concepts such as sets, functions, matrix algebra, and discrete mathematics, and apply them in computational problem-solving.
CO2: Utilize mathematical models and techniques to analyze and solve problems in computer science, including algorithmic design, complexity analysis, and data representation.
CO3: Apply mathematical principles to abstract and formalize computer science problems, enabling efficient problem analysis and solution formulation.
CO4: Develop foundational skills in mathematical reasoning, logic, and discrete structures to enhance problem-solving abilities in computer science applications.

Text Books

1. Garg, Reena, "Engineering Mathematics", Khanna Book Publishing Company, 2024.
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

BCG-103-V1
Problem Solving Techniques
BCA & BCA (DS)-I Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks

Duration of Exam: 3 Hours

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 pseudo code of the algorithm using basic building blocks or structured programming constructs (Sequence, Selection and Repetition statement).
4. Translate an algorithm into a C computer program
5. Testing and analyzing programs using debugging tools.

Prerequisite: This is an introductory programming course and hence no prerequisites.

UNIT I: 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 Subproblems, Input/Output Specification, Input Validation, Pre and Post Conditions.

UNIT II: 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 Typeless 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: 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: 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.

Course Outcomes (COs) :

At the end of program the student will be able to**:**

- **CO1:** Explain fundamental concepts of computers, problem-solving approaches, programming languages, and their evolution.
- **CO2:** Formulate precise problem specifications by identifying ambiguities and refining requirements through effective questioning.
- **CO3:** Design algorithmic solutions using structured programming constructs such as sequence, selection, and repetition, and represent them using pseudocode.
- **CO4:** Implement algorithms by translating them into C programs, demonstrating proficiency in syntax and logic.
- **CO5:** Debug, test, and analyze C programs using appropriate tools to ensure correctness and efficiency.

Text Books

1. Venkatesh, Nagaraju Y, "Practical C Programming for Problem Solving", Khanna Book 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 How to Program", 9th edition, 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.

BCG-105-V1
Computer Architecture
BCA & BCA (DS)-I Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

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

Prerequisite: This is an introductory programming course and hence no prerequisites.

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, Demultiplexer

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

Register: 4 bit register with parallel load, Shift Registers- Bidirectional shift register with parallel load, Binary Counters-4 bit synchronous and Asynchronous binary counter.

UNIT-III

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator logic. Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer(RISC), RISC Vs CISC.

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.

Course Outcomes (COs) :
At the end of program the student will be able to**:**

CO1: Demonstrate a fundamental understanding of digital electronics concepts and the binary number system.
CO2: Design and implement combinational circuits using logic gates and Boolean algebra.
CO3: Design and implement sequential circuits such as flip-flops, registers, and counters.
CO4: Explain the basic organization and architecture of a computer system.
CO5: Analyze the concept of parallel processing and its role in improving computational efficiency.
CO6: Describe different memory organization techniques and their impact on system performance.

Text Books

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

Reference Books

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

VAC-104-V1
IKS-I: Indian Knowledge System
BCA & BCA (DS)-I Semester

No. of Credits:			2		
L	T	P	Total	Sessional:	25 Marks
2	0	0	2	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To provide an overview of different knowledge systems originated in India.
2. To introduce in the students a comprehensive understanding of Indian ethics and values.

UNIT-I: Introduction and foundational concepts of IKS (4 Hrs)

Overview of various streams of knowledge in India and classification of ancient Indian texts; Various philosophical systems of India and fundamental principles inlaid in them

UNIT-II: Psychology from Indian perspective, Yoga and Indian Linguistics (4 Hrs)

Introduction to Ashtanga Yoga; Rasa Siddhanta of Natyasastra(theory of emotions), Panini's contribution to linguistics; Contributions of the Vakyasastra and Pramanasastra to linguistics

UNIT-III: Indian Mathematics and Astronomy (8 Hrs)

An overview of Indian mathematics, Development of arithmetic geometry and Trigonometry; Introduction to spherical geometry and calculus in India. Vedic system of arithmetic computation, Vedic sutra for arithmetic computation. An introduction to Indian Astronomy, Pre and Post Siddhantic period

UNIT-IV: Medicinal traditions in India (3 Hrs)

An Introduction to Ayurveda; Distinct features of Ayurveda, as compared to Alopathy; Excerpts from Sutrasthana

UNIT-V: Indian Architecture and Planning (3 Hrs)

Traditional measurement system used in Vastusastra, Prescriptions for residential Vastu, City planning as per Vastusastra.

UNIT-VI: Economics, Management and Governance (4 Hrs)

An overview of Indian economic thought- Arthasastra and Nitisastra, Leadership and Motivation, Planning and Organizing, Financial Management etc.

Course Outcomes (COs) :

At the end of program the student will be able to**:**

CO1: Explain the fundamental concepts and evolution of various knowledge systems that originated in India.
CO2: Demonstrate a comprehensive understanding of Indian ethics and values and their relevance in contemporary society.

SUGGESTED BOOKS:

1. Introduction to Indian Knowledge System, B. Mahadevan, V. R. Bhat, Nagendra Pavana R. N., PHI. 2022
2. Yoga System of Patanjali, J. H. Woods, Bharatiya Kala Prakashan 2009
3. Indian Philosophy Vol I and II, S. Radhakrishnan, Oxford University Press. 2009
4. Mayamatam Indian Treatise on Housing, Architecture and Iconography (2 volumes), Bruno Daegens, Indira Gandhi National centre for Arts. 2007
5. Vedanta and Management: Relevance of Vedantic Concepts in Modern Management Practices, N. V. Dave, Deep & Deep. 2002
6. Tantrasa graha with detailed Mathematical Explanatory Notes, K. Ramasubramanian, M. S. Sriram, Hindustan Book Agency. 2011
7. Karanapadhati of Putumana Somayaji, Venkateswara Pai, Ramasubramanian, M. S. Sriram and M.D. Srinivas, Hindustan Book Agency 2018
8. New Delhi 2002
9. The Nigha Motilal Banarsidass Publishers 2015
10. ga Literature, Archak K.B. Kaveri Books, New Delhi, 2012
11. Textbook of Ayurveda: Volume 1 - Fundamental Principles of Ayurveda, Vasant Lad, Ayurvedic Press; UK ed. Edition 2002
12. Sanskrit Academy, Hyderabad. 2010
13. Vedic Mathematics, Jagadguru Swami Sri Bharati Krsna Tirathji Maharaj, Motilal Banarsidass Publishers, Delhi 1965
14. Lilavati Bhaskaracarya: A Treatise of Mathematics of Vedic Tradition, K S Patwardhan, S A Naimpally and Shyam Lal Singh, Motilal Banarsidass Publishers Pvt Ltd, Delhi 2006

AEC-105-V1
General English – I
BCA & BCA (DS)-1 Semester

No. of Credits:			2		
L	T	P	Total	Sessional:	25 Marks
2	0	0	2	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

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

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 Skill

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, Cliches

Unit- IV: Nature and Style of sensible Writing

Describing, Defining, Classifying, providing examples or evidence

Unit- V: **Writing introduction and conclusion**: Writing Practices, Comprehension, Précis Writing, Essay Writing

Text/Reference Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. acmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Alternative NPTEL/SWAYAM Course:

S.No.	NPTEL/SWAYAM Course Name	Instructor	Host Institute
1	English language for competitive exams	Prof. Aysha iqbal	IIT MADRAS
2	Technical English for engineers	Prof. Aysha iqbal	IITM

Course Outcomes: The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills

VAC- 101-V
Environmental Science and Sustainability
BCA & BCA (DS)-I Semester

No. of Credits:			2		
L	T	P	Total	Sessional:	25 Marks
2	0	0	2	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objective(s):

1. This course aims to familiarize students with basic environmental concepts, their relevance to business operations, and forthcoming sustainability challenges.
2. This course will equip students to make decisions that consider environmental consequences.
3. This course will enable future business graduates to become environmentally sensitive and responsible managers.

Course Content:

Unit 1: Understanding Environment, Natural Resources, and Sustainability
Fundamental environmental concepts and their relevance to business operations; Components and segments of the environment, the man-environment relationship, and historical environmental movements. Concept of sustainability; Classification of natural resources, issues related to their overutilization, and strategies for their conservation. Sustainable practices in managing resources, including deforestation, water conservation, energy security, and food security issues. The conservation and equitable use of resources, considering both intergenerational and intergenerational equity, and the importance of public awareness and education.

Unit 2: Ecosystems, Biodiversity, and Sustainable Practices
Various natural ecosystems, learning about their structure, functions, and ecological characteristics. The importance of biodiversity, the threats it faces, and the methods used for its conservation. Ecosystem resilience, homeostasis, and carrying capacity, emphasizing the need for sustainable ecosystem management. 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.

Unit 4: Social Issues, Legislation, and Practical Applications

Dynamic interactions between society and the environment, with a focus on sustainable development and environmental ethics. Role of businesses in achieving sustainable development goals and promoting responsible consumption. Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Environmental justice, environmental refugees, and the resettlement and rehabilitation of affected populations; Ecological economics, human population growth, and demographic changes in India.

Course Outcome(s):

At the end of program the student will be able to**:**

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.

Text Books (Latest Editions):

- Poonia, M.P. "Environmental Studies" (3rd ed.), Khanna Book Publishing Co.
- Bharucha, E, "Textbook of Environmental Studies" (3rd ed.) Orient Blackswan Private Ltd.
- Dave, D., & Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
- Rajagopalan, R, "Environmental studies: from crisis to cure" (4th ed.). Oxford University Press.
- Miller, G.T. & Spoolman S., "Living in the Environment" (20th ed.). Cengage.
- Basu, M., & Xavier Savarimuthu, S. J., "Fundamentals of environmental studies", Cambridge University Press.

References

- Roy, M. G., "Sustainable Development: Environment, Energy and Water Resources". Ane Books.
- Pritwani, K., "Sustainability of business in the context of environmental management", CRC Press.
- Wright, R.T. & Boorse, D.F., "Environmental Science: Toward A Sustainable Future" (13th

ed,). Pearson.

Web links:

- https://www.ourplanet.com
- https://www.undp.org/content/undp/en/home/sustainable-development-goals.html
- www.myfootprint.org
- https://www.globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem /ecosystem.html

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AEC-309-V
Ability Enhancement Elective-1
French-I
BCA & BCA (DS)-I Semester

NO OF CREDITS: 0
L T P
2 0 0

SESSIONAL: 25
THEORY EXAM: 75
TOTAL: 100
Duration of Exam: 3 hrs.

Each lesson is divided into three parts which consist of Dialogue, Vocabulary and Grammar.

Course Objectives:

1. To introduce the script of French Language
2. To make students familiar with the pronunciation of basic French words
3. To learn basic vocabulary of French.
4. To make student familiar with grammar of French

Course Outcomes:

At the end of program the student will be able to**:**

CO1: Learned the script of French Language

CO2: Will be aware of pronunciation of basic French words.

CO3: Learned vocabulary of French language.

CO4: Will be able to apply the grammar rules in sentences and paragraph writing.

Unit I: **OBJECTIFS COMMUNICATIFS**

- S'initiera'laculturefrancaise
- De'crirelinepersonne
- Direlanationalite'
- Parlerdessaisons
- Localizerdesobjects
- Demanderldonnerdesgoûtsetdespréférences

Unit II:

GRAMMAIRE/ VOCABULAIRE

- Lesverbesen(er)
- Lespronomssujels
- Lesarticlesdefinis
- Lecorpshumain
- Lesverbesen(ir)
- Lesarticlesinde'finis
- Lanegation

- Lesverbesen(ger)
- Lefe'minimetlepluriel
- Lesexpressionsavecfaire
- Les(nombres)(1-100)
- Lesprepositions
- L'interrogations
- Lesverbsen(re)etirreguliers
- Lesrepasfrancais
- Lesadjectifspossessifs
- De'crireuneville

References:

1. APPRENONS LE FRANCAIS Methode de Francais by MahithaRanjit , Monica Singh
2. LE NOUVEAU SANS FRONTIERES Methode de FrancaisbyPhilippeDomonique, Jacky Girardet
3. Took reference from BhartiaVidyaBhawan institute of foreign languages.

AEC-307-V

Ability Enhancement Course (AEC)

GERMAN- I

BCA & BCA (DS)-I Semester

		SESSIONAL	: 25
L	P	FINAL EXAM	: 75
2	0	TOTAL	: 100

NOTE: Question paper will have two parts. Part-A is copulsory and contains 10 questions each of 1.5 marks covering the entire syllabus. Part-B has 6 questions each of 15 marks and students are required to attempt any four questions from this part.

Course Objectives:

1. To introduce the script of German Language
2. To make students familiar with the pronunciation of basic German words
3. To learn basic vocabulary of German.
4. To make student familiar with grammar of German

Course Outcomes:

At the end of program the student will be able to**:**

CO1: Learned the script of German Language
CO2: Will be aware of pronunciation of basic German words.
CO3: Learned vocabulary of German language.
CO4: Will be able to apply the grammar rules in sentences and paragraph writing.

Unit-I Introduction
Basic Greetings in German

Unit-II Counting 1-100
Basic questions in German
Introduce yourself

Unit-III Personal Pronouns
Verb conjugations (regular verbs)

Unit-IV Articles- der, die, das
Vocabulary (classroom objects with articles)

Unit-V Days, months, seasons + im/am
Time (formal & informal)
Counting 1000+

Unit-VI Verb Conjugations (Irregular verbs)
Separable Verbs

Reference Books:

1. Netzwerk A1 by Paul Rusch
2. Studio d A1 by Funk, Kuhn, Demm

BCG-107-V1
Problem Solving Techniques: Lab
BCA & BCA (DS)-I Semester

No. of Credits: 2

L	T	P	Total
0	0	4	4

Sessional: 15 Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

UNIT-I

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 (>= 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 therange [1,n]?
5. Display first mathematical tables, each table up to 10 rows? Generalise this todisplay first 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

7. Display the following patterns of n rows (n > 0), for the below examples n = 5?

Hollow square pattern:	Triangle Patterns with numbers:	Square with diagonals:	Diamond Pattern
##### # # # # # # #####	1 121 12321 1234321 123454321	* *	* *** ***** *** *

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 theTaylor 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 ofthe Taylor series for sin(x)/cos(x)?

UNIT-II

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, forthe 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 ($0 \leq$ marks ≤ 100) of a subject. Grading Scheme: 80-100 : A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using both else-if ladder and switch case?
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 <= input Base, outputBase <= 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 = weightinKGs / (HeightinMeters *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 III

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, subtractionand 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 x^y using only multiplication?
    d. To print a sequence of numbers entered using sentinel controlledrepetition in reverse order?

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BCG-109-V1
Computer Architecture-Lab
BCA & BCA (DS)-I Semester

No. of Credits: 2

L	T	P	T
0	0	4	4

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

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 4 bit shift register using Flip flops.
14. Implement Boolean function using logic gates in both SOP and POS
15. Design and Implement a 4 bit synchronous counter.
16. Design and verify 4 bit 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 mother board 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
10. To study the installation of Printer and trouble shooting.

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SEMESTER -II

BCG-102-V1
Mathematics Foundation to Computer Science - II
BCA & BCA (DS)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1. To understand correct lines of arguments and proofs.
2. To introduce mathematical techniques that are foundations for understanding advanced computational methods, including numerical methods and optimization.
3. To understand various problem-solving strategies and methods to tackle both theoretical and practical challenges in computer science
4. To understand Optimization Techniques.

Syllabus:

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, LP formulation, Graphical method for solving LPs 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, MODI method for finding optimum solution.

Course Outcomes:

At the end of program the student will be able to**:**

CO1: Use correct lines of arguments and proofs.
CO2: Apply advanced computational methods, including numerical methods and optimization in problems.
CO3: Solve both theoretical and practical challenges in computer science.
CO4: Apply optimization Techniques to find optimal solution to the problems.

Text Books/Reference 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, Macmilllan Publishers, 2007.

Web Resources

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

BCG-104-V1
Data Structures
BCA & BCA (DS)-II Semester

No. of Credits:			3
L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives:

1. To understand the fundamental concepts of Data Structures and their applications.
2. To develop problem-solving using Linked List, Stacks and Queues Data Structures.
3. To understand problem-solving using recursion, Graphs and Tress using Data Structures.
4. To implement Data Structures using C programming language.

Prerequisite:

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

Syllabus:

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, Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. 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.

UNIT-IV: 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.

Course Outcomes:

At the end of this course student will be able to:

CO1: Apply fundamental concepts of Data Structures.
CO2: Solve problems using Linked List, Stacks and Queues.
CO3: Implement recursion and solve problems based on Graphs and Tress.
CO4: Solve problems of Data Structures using C programming language

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, 2022.

Reference Books

1. Reema Thareja, “Data Structures Using C", Second Edition, Oxford University Press, 2014.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, Universities Press, 2007.
3. Langsam / Augenstein / Tenenbaum , “Data Structures using C and C++”.

BCG-106-V1
Operating Systems
BCA & BCA (DS)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Course Objectives:

1 To introduce the fundamentals of digital electronics.
2. To familiar the students about the design and analyze various combinational circuits.
3. To give exposure to the students about design and analyze various sequential circuits.
4. To introduce various converters.

Syllabus:

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.

Course Outcomes:

At the end of program the student will be able to:

CO1: Implement scheduling of algorithms.
CO2: Understand the concept of critical section problems.
CO3: Analyse the concepts of file allocation of frames.
CO4: Use the concept of Page replacement 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.
3. Maurice J. Bach, "The Design of the UNIX Operating System", Pearson Education Inc., 1986.

BCG-108-V1
Object Oriented Programming using Java
BCA & BCA (DS)-II Semester

No. of Credits:			3		
L	T	P	Total	Sessional:	25 Marks
3	0	0	3	Theory:	75 Marks
				Total:	100 Marks
				Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives

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

Prerequisite: Knowledge of Problem Solving Techniques using C programming language

Syllabus:

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.

UNIT-II: Constants, Variables and Data Types: Constants, Variables, Data Types, Declaration of Variables, Giving values to Variables, Symbolic Constants, Type casting.
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, Multithreading and Inter-thread communication and synchronization.

Course Outcomes (COs):

At the end of program the student will be able to:

CO1: Explain the object oriented programming system concepts.
CO2: Use syntax and semantics of Java programming language.
CO3: Develop programs using Java.
CO4: Use and setup JDK environment to create, debug and run Java programs

Text Books

1. Balaguruswamy E., "Programming with JAVA: A Primer", 7th edition. India: McGraw Hill Education, 2023
2. Schildt, H., "Java: The Complete Reference",12th edition. McGraw-Hill Education. Reference Books, 2022
3. Arunesh Goyal, "The Essentials of JAVA", Khanna Book Publishing Company Private Limited, 2012.
4. Tanweer Alam, "Core JAVA", Khanna Book Publishing Company Private Limited, 2015.
5. Y. Daniel Liang, "Introduction to Java Programming", 7th Edition, Pearson, 2008.
6. 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

BCG-110-V1

Web Technologies
BCA & BCA (DS)-II Semester

No. of Credits: 2

L	T	P	Total
2	0	0	2

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

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

Prerequisite:

1. Proficiency in at least one programming language, such as Python, Java, or C++.
2. Understanding of programming concepts such as loops, conditionals, functions, and data structures like arrays, lists.
3. Familiarity with object-oriented programming (OOP) principles, including classes, objects, inheritance, and polymorphism.

Syllabus:

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 web page. 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 **a**nd Arrays in JavaScript.Date and String handling in JavaScript.

Unit-III: 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.

Course Outcomes (COs):

At the end of program the student will be able to:

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

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

CO3: Develop applications based on embedded dynamic scripting on client and server side Internet programming and basic full stack web development.

CO4: Implement modern interactive web applications.

Text Books

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

Reference Books

1. Silvio Moreto, "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/

VAC-112-V1
Indian Constitution
BCA & BCA (DS)-II Semester

No. of Credits:			2
L	T	P	Total
2	0	0	2

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Course Objectives

1. To provide understanding of knowledge of the Indian constitution.
2. To understand the correlation between Indian constitution, democracy and media.

UNIT I: Understanding Constitution power structure

1.1 Meaning and importance of the Constitution, salient features of the Indian Constitution.

1.2 The Preamble of the Constitution.

1.3 Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

1.4 Parliamentary democracy, Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions,

1.5 State legislative assemblies and legislative council, State Executive

UNIT II: Constitution and Democracy

2.1 Constitutional bodies,

2.2 4 pillars of Democracy,

2.3 Election Commission of India-composition, powers and functions and electoral process.

2.4 Types of emergency grounds, procedure, duration and effects.

2.5 Amendment of the constitution- meaning, procedure and limitations and special provisions.

Course Outcomes:

At the end of program the student will be able to:

CO1: Have an understanding of our Indian Constitution.

CO2: Students will understand the correlation between the Indian constitution, democracy and media.

Suggested readings/weblinks

1. M.v.pylee, “Introduction to the constitution of India”,4th Edition, Vikas publication,2005.
2. Durga Das Basu(DDBasu) , “Introduction to the constitution of India”,(Student Edition),19th edition,Prentice-Hall EEE, 2008.
3. https://www.youtube.com/watch?v=7ay59AGjp1Y&pp=ygUSaW5kaWFuIGNvbnN0dXRpb24g
4. https://www.youtube.com/watch?v=uIZik791zRA&pp=ygUlaW5kaWFuIGNvbnN0aXR1dGlvbiB2aWthcyBkaXZ5YWtpcnRpIA%3D%3D

5. https://www.youtube.com/watch?v=xiVAIcDVYew&pp=ygUlaW5kaWFuIGNvbnN0aXR1dGlvbiB2aWthcyBkaXZ5YWtpcnRpIA%3D%3D

AEC-310-V
Ability Enhancement Course (AEC)
FRENCH-II (WITH FRENCH-I AS PRE-REQUISITE)
BCA & BCA (DS)-II Semester

No. of credits: 0		Duration of Exam: 3 Hours	
		Sessional Marks	: 25
L	P	Final exam	: 75
2	0	TOTAL	: 100

NOTE: Question paper will have two parts. Part-A is compulsory and contains 10 questions each of 1.5 marks covering the entire syllabus. Part-B has 6 questions each of 15 marks and students are required to attempt any four questions from this part.

Each lesson is divided into three parts which consist of Dialogue, Vocabulary and Grammar.

Course Objectives:

1.To introduce the advance Grammar of French Language
2.To develop good writing skills in French language through paragraphs and emails
3.To make student converse in French Language through group discussions

Syllabus:

Description du materiel

Unit-I: OBJECTIFS COMMUNICATIFS

- S'initiera'laculturefrancaise
- Salut
- Parlerdelaquantite
- Decrireunepersonne
- Parlerdelafamille
- Decrirelajournee
- Direl'heure
- Parlerdessaisons
- Interrogersur/ParlerdelaSante

Unit-II: GRAMMAIRE/ VOCABULAIRE

- Lesverbesen(er,ir,re)
- Lanegation
- Lesarticles
- Lesadverbesdequantite
- Lefemininetleplurieldesnomsetdesadjectifs
- Lapositiondesadjectifs
- L'infinitifapresunautreverbe
- Lesmembresdelafamille

- Lesverbespronominaux
- Lesnombrescardinauxetordinaux
- Lessaisons,lesjoursdelasemaineetlesmoisdel'anneeTroisformesd'interrogation
- L'interrogationnegativeet(si)
- Lesexpressionsavec(avoir)
- Lesanimaux
- Lescouleurs

Course Outcomes:

At the end of program the student will be able to:

CO1: Apply the grammar rules in sentences and paragraph writing

CO2: Write emails and paragraphs in French

CO3: Communicate in French language

References:

1. a) APPRENONS LE FRANCAIS Methode de Francais by MahithaRanjit , Monica Singh

b) LE NOUVEAU SANS FRONTIERES Methode de Francais by PhilippeDomonique, Jacky Girardet

2. Took reference from BhartiaVidyaBhawan institute of foreign languages.

AEC-308-V
Ability Enhancement Course (AEC)
GERMAN- II (with German-I as pre-requisite)
BCA & BCA (DS)-II Semester

No. of credits: 0	Duration of Exam: 3 Hours
	Sessional Marks : 25
L P	Final exam : 75
2 0	TOTAL : 100

Course Objectives:

1. To introduce the advance Grammar of German Language
2. To develop good writing skills in German language through paragraphs and emails.
3. To make student converse in German Language through group discussions

Unit-I Hobbies
Professions

Unit-II Family
Possesive pronouns and articles

Unit-III Nominative and Accusative case
Definite and indefinite articles in German

Unit-IV Articles- der, die, das
Vocabulary (classroom objects with articles)

Unit-V Modal Verbs
Imperative

Unit-VI W-questions
Introduction

Course Outcomes:

At the end of program the student will be able to:

CO1: Apply the grammar rules in sentences and paragraph writing.

CO2: Write emails and paragraphs in German.

CO3: Communicate in German language.

Reference Books*:*

1. Netzwerk A1 by Paul Rusch
2. Studio d A1 by Funk, Kuhn, Demme

BCG-112-V1
Data Structure Lab
BCA & BCA (DS)-II Semester

No. of Credits: 2

L	T	P	T
0	0	4	4

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of 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) Preorder Traversal
    (b) Inorder Traversal
    (c) Postorder Traversal
20. Write a program to perform insertion operation in a binary search tree.

BCG-114-V1
Operating Systems Lab
BCA & BCA (DS)-II Semester

No. of Credits:			1
L	T	P	T
0	0	2	2

Sessional:	15Marks
Theory:	35 Marks
Total:	50 Marks
Duration of Exam:	3 Hours

List of Programs:

1. Write C program to simulate the FCFS CPU Scheduling algorithm.
2. Write C program to simulate the SJF CPU Scheduling algorithm.
3. Write 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 to write a C program for implementing sequential file allocation method.

BCG-116-V1
Object Oriented Programming using Java Lab
BCA & BCA (DS)-II Semester

No. of Credits: 2

L	T	P	T
0	0	4	4

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

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 AddSub with methods to add and subtract. Create another class called MulDiv that extends from AddSub class to use the member data of the super class. MulDiv 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 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.
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 subclass 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.
20. 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 UnderAge exception if the variable age passed to it as argument is less than 18. Write main() method also to show working of the program.
21. Implement Producer-consumer problem using multi-threading.

BCG-118-V1
Web Technologies Lab
BCA & BCA (DS)-II Semester

No. of Credits:			1
L	T	P	T
0	0	2	2

Sessional: 15Marks
Theory: 35 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

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 super market 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 andexternal) toformat college web page 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 addiction, 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