DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS
(*First Year*)

for

Bachelor of Computer Applications
BCA
(Under Graduate Three Year Course in Computer Application)

As per
NEP2020
(Effective from the Session: 2024-25)

BACHELOR OF COMPUTER APPLICATIONS (Three Year Course) BCA Ist Year

BCA First Year Evaluation Scheme, 2024-25

SEMESTER-I

S. No.	Subject Code	Subject Name	Periods			Sessional			ESE	Total	Credit
			L	T	P	CT	TA	Total			
1.	BBC101	Fundamentals of Computer	3	1	0	20	10	30	70	100	4
2.	BBC102	Mathematical Foundation	3	1	0	20	10	30	70	100	4
3.	BBC103	Problem Solving Using C	3	1	0	20	10	30	70	100	4
4.	BBC104	Communication Skills	3	0	0	20	10	30	70	100	3
5.	BBC105	Environment and Ecology	3	0	0	20	10	30	70	100	3
6.	BBC151	Problem Solving Using C Lab	0	0	3	30	20	50	50	100	2
7.	BBC152	Communication Skills Lab	0	0	3	30	20	50	50	100	2
		Total	15	3	6			250	450	700	22

CT: Class Test **TA**: Teacher Assessment   **L/T/P**: Lecture/ Tutorial/ Practical

SEMESTER-II

S. No.	Subject Code	Subject Name	Periods			Sessional			ESE	Total	Credit
			L	T	P	CT	TA	Total			
1.	BBC201	Digital Electronics	3	1	0	20	10	30	70	100	4
2.	BBC202	Discrete Mathematics	3	1	0	20	10	30	70	100	4
3.	BBC203	Data Structure	3	1	0	20	10	30	70	100	4
4.	BBC204	Professional Communication	3	0	0	20	10	30	70	100	3
5.	BBC205	Information Systems	3	0	0	20	10	30	70	100	3
6.	BBC251	Data Structure Lab	0	0	3	30	20	50	50	100	2
7.	BBC252	Professional Communication Lab	0	0	3	30	20	50	50	100	2
8.	BVA251	Sports and Yoga*	0	0	3		100				0
		Total	15	3	9			250	450	700	22

CT: Class Test **TA**: Teacher Assessment   **L/T/P**: Lecture/ Tutorial/ Practical

* Non-credit Course

BCA
FIRST YEAR SYLLABUS
SEMESTER-I

BBC101: FUNDAMENTALS OF COMPUTER		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to understand		
CO 1	Understand the basics of computer system and its functional units.	K_1, K_2
CO 2	Examine memory hierarchy, cache memory and CPU memory interaction.	K_2
CO 3	Analyze different number systems and apply computer arithmetic.	K_3, K_4
CO 4	Understand the concepts of operating systems and computer networks.	K_2
CO 5	Understand the basics of internet and multimedia.	K_1, K_2
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Computer:** Introduction, Characteristics, Limitations, Generations and Classification. **Hardware:** Introduction, Input devices - keyboard, MICR, OMR, bar code reader etc., Output devices -visual display unit, printers, plotters etc. **Software:** Introduction, Types – system and application.	**08**
II	**Memory Unit:** Introduction, Hierarchy, Primary Memory, Secondary memory, Cache memory, Virtual memory. **Secondary Storage Devices:** Introduction, Magnetic disk, Magnetic tape, Optical disks, Flash memory etc. **Computer Languages:** Introduction, Compiler, Interpreter and Assembler.	**08**
III	**Computer Codes:** Introduction, Binary, Decimal, Octal, Hexadecimal, 4-bit BCD, 8-bit BCD, ASCII codes. **Conversion of Numbers:** Binary to decimal, Decimal to binary, Binary to octal, Octal to binary, Binary to hexadecimal, etc. **Binary Arithmetic:** Addition, Subtraction, Multiplication, Division. Complements of binary numbers.	**08**
IV	**Operating System:** Definition, Functions, Types, Classification, Introduction of command based and GUI based operating system. **Windows Operating System:** Introduction, Elements, Use of menus, Tools and Commands. **Computer Networks-** Introduction, Types - LAN, WAN and MAN, Topologies, Data communication.	**08**
V	**Internet:** Overview, Architecture, History, Functioning, Applications. **Basic Services of Internet:** WWW, Email, FTP, Telnet, Gopher, Search engines, News group, Chat rooms, etc. **Multimedia**: Overview, Components, Software tools, Applications, Transition from conventional media to digital media.	**08**

Suggested Readings:
     1. Sinha P.K. and Sinha P., "Computer Fundamentals", BPB Publications.
     2. Balagurusamy E., "Fundamentals of Computers", Tata McGraw Hill.
     3. Rajaraman V., "Fundamentals of Computers", PHI.		

4. Leon A. and Leon M., "Introduction to Computers", Vikas Publishing House.
5. Norton P., "Introduction to Computers", McGraw Hill Education.
6. Goel A., "Computer Fundamentals", Pearson.
7. Li Z.N. and Drew M.S., "Fundamentals of Multimedia", Pearson Education.

BBC102: MATHEMATICAL FOUNDATION		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe and interpret the concept of determinants and matrices.	K_2, K_3
CO 2	Understand the concept of linear equations.	K_2
CO 3	Describe differentiation and its uses.	K_3, K_4
CO 4	Understand the concepts of differential equation, integration and their uses.	K_3, K_4
CO 5	Develop an understanding on concepts of Laplace Transform and Graph theory.	K_1, K_2
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Determinants**: Definition, Minors, Cofactors, Properties of Determinants. **Matrices:** Definition, Types of Matrices, Operations on Matrices, Algebra of Matrices, Determinant of a Square Matrix, Elementary transformations, Inverse of a Square Matrix, Rank of a Matrix, , Row - reduced Echelon form, Gaussian/Gauss-Jordan elimination.	**08**
II	**Linear Algebraic system:** Linear dependence and Independence of vectors, Definition of a Vector in 2 and 3 Dimensions. Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues Eigenvectors Cayley-Hamilton Theorem, Rank & Nullity. Linear transformations.	**08**
III	**Differential Calculus:** Differentiation and derivatives: Derivative, Basic laws of derivative, Successive differentiation (Chain rule), Leibnitz's Theorem, Partial derivatives, Euler's theorem for homogeneous functions, Jacobian.	**08**
IV	**Differential Equations:** Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals. **Integral Calculus:** Integral, Integration by parts, Beta and Gamma functions: definition and properties.	**08**
V	**Laplace Transform:** Laplace transform, Existence theorem, Laplace transform of derivatives and integrals. First shifting and second shifting theorems, Unit Step function, Convolution theorem. **Introduction to Graph Theory:** Graphs, Paths, Cycles, Euler and Hamilton graphs, Connectivity, Adjacency matrix, Incidence Matrix. Planar graphs.	**08**
Suggested Readings:		

1. Strang G., "Calculus", Wellesley-Cambridge Press.
2. Apostol T.M., "Calculus, Volume 1: One-Variable Calculus with an Introduction to Linear Algebra", Wiley India.
3. Jain M.K. and Iyengar S.R.K., "Computational methods for Partial

Differential Equations", New Age International Publishers.
4. Sharma G.C. and Sharma I.J.S., "Engineering Mathematics", CBS Publishers.
5. Dhami H.S., "Differential Calculus", New Age International Publishers.
6. Dass H.K. and Verma R., "Introduction to Engineering Mathematics-Volume I", S. Chand Publishing.
7. Dass H.K and Verma R., "Introduction to Engineering Mathematics-Volume II", S. Chand Publishing.
8. Bali N.P. and Goyal M., "A Textbook of Engineering Mathematics Semester I", University Science Press.
9. Bali N.P. and Goyal M., "A Textbook of Engineering Mathematics Semester II", University Science Press.

BBC103: PROBLEM SOLVING USING C		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Describe the functional components and fundamental concepts of a digital computer system including number systems.	K_1, K_2
CO 2	Construct flowchart and write algorithms for solving basic problems.	K_2, K_3
CO 3	Write 'C' programs that incorporate use of variables, operators and expressions along with data types.	K_2, K_3
CO 4	Write simple programs using the basic elements like control statements, functions, arrays and strings.	K_2, K_3
CO 5	Write advanced programs using the concepts of pointers, structures, unions and enumerated data types.	K_2, K_3
CO 6	Apply pre-processor directives and basic file handling and graphics operations in advanced programming.	K_2, K_3
DETAILED SYLLABUS		
Unit	Topic	Proposed Lecture
I	**Basics of programming:** Approaches to problem solving, Use of high level programming language for systematic development of programs, Concept of algorithm and flowchart, Concept and role of structured programming. **Basics of C**: History of C, Salient features of C, Structure of C Program, Compiling C Program, Link and Run C Program, Character set, Tokens, Keywords, Identifiers, Constants, Variables, Instructions, Data types, Standard Input/Output, Operators and expressions.	**08**
II	**Conditional Program Execution:** if, if-else, and nested if-else statements, Switch statements, Restrictions on switch values, Use of break and default with switch, Comparison of switch and if-else. **Loops and Iteration:** for, while and do-while loops, Multiple loop variables, Nested loops, Assignment operators, break and continue statement. **Functions:** Introduction, Types, Declaration of a Function, Function calls, Defining functions, Function Prototypes, Passing arguments to a function Return values and their types, Writing multifunction program, Calling function by value, Recursive functions.	**08**
III	**Arrays:** Array notation and representation, Declaring one-dimensional array, Initializing arrays, Accessing array elements, Manipulating array elements, Arrays of unknown or varying size, Two-dimensional arrays,	**08**

	Multidimensional arrays. **Pointers:** Introduction, Characteristics, * and & operators, Pointer type declaration and assignment, Pointer arithmetic, Call by reference, Passing pointers to functions, arrayof pointers, Pointers to functions, Pointer to pointer, Array of pointers. **Strings:** Introduction, Initializing strings, Accessing string elements, Array of strings, Passing strings to functions, String functions.	
IV	**Structure:** Introduction, Initializing, defining and declaring structure, Accessing members, Operations on individual members, Operations on structures, Structure within structure, Array of structure, Pointers to structure. **Union:** Introduction, Declaring union, Usage of unions, Operations on union. Enumerated data types **Storage classes**: Introduction, Types- automatic, register, static and external.	**08**
V	**Searching and Sorting:** Introduction to searching and sorting, Linear search, Binary search, Selection sort, Bubble sort. **Dynamic Memory Allocation**: Introduction, Library functions – malloc, calloc, realloc and free. **File Handling:** Basics, File types, File operations, File pointer, File opening modes, File handling functions, File handling through command line argument, Record I/O in files.	**08**

Suggested Readings:
1. Kanetkar Y., "Let us C", BPB Publications.
2. Balagurusamy E., "Programming with ANSI-C", Tata McGraw Hill.
3. Hanly J.R. and Koffman E.B., "Problem Solving and Program Design in C", Pearson Education.
4. Gottfried B.S., "Programming with C Language, Schaum Series, Tata McGraw Hill.
5. Goyal K. K. and Pandey H.M., Trouble Free C", University Science Press.
6. Kernighan and Richie, "C Programming", Prentice Hall of India.
7. Forouzan B.A. and Gilberg R.F., "A Structured Programming Approach Using C, Cengage Learning.
8. Goyal K. K., Sharma M. K. and Thapliyal M. P. "Concept of Computer and C Programming", University Science Press.

BBC104: COMMUNICATION SKILLS		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the basic concepts of communication and make aware of technical issues related to communication.	K_2
CO 2	Analyze the importance of effective communication.	K_2, K_3
CO 3	Develop interpersonal and leadership skills.	K_4
CO 4	Implement presentation and interaction skills for group discussion, debate and interviews.	K_4, K_5
CO 5	Develop effective speaking and writing skills.	K_4
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed**

		Lecture
I	Communication skills: Introduction, Definition, Importance of communication, communication process–source, Message, encoding, channel, Decoding, Receiver, Feedback, Barriers to communication, word choice, vocabulary building.	08
II	Elements of Communication, Introduction to oral communication, Confidence, clarity, and fluency, verbal and Nonverbal communication. Paralinguistic features, proxemics, chronemics.	08
III	Interpersonal Communication Skills, Team work, Empathy, Emotional intelligences, Empathy and listening skills, Time Management, Attitude, Responsibility, Leadership qualities-integrity, values, Trust, Self-confidence and courage, speed reading, problem solving and trouble shooting.	08
IV	Presentation and Interaction Skills: speech delivery, Group discussions-objective and methods, debate and discussions, Public speaking-Audience analysis approach and style. Interviews- Types, Focus and objectives.	08
V	Speaking Skills: Meaning, Elements, Importance and type of speaking skills, Writing Skills- Clarity in writing, Principles of effective writing, Orel presentation.	08

Suggested Reading:
1. Raman M. and Sharma S., "Technical Communication", Oxford University Press.
2. Mehra P., "Business Communication for Managers", Pearson.
3. Wallace H.R., "Personality Development for Life and Work", Cengage India Pvt. Ltd.
4. Pfeiffer W.S., "Public Speaking, William", Pearson.

BBC105: ENVIRONMENT AND ECOLOGY		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Gain in-depth knowledge on natural processes that sustain life, and govern economy.	K_2
CO 2	Estimate and Predict the consequences of human actions on the web of life, global economy and quality of human life.	K_3
CO 3	Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.	K_4
CO 4	Acquire values and attitudes towards understanding complex environmental economic social challenges, and participate actively in solving current environmental problems and preventing the future ones.	K_3
CO 5	Adopt sustainability as a practice in life, society and industry.	K_3
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Environment:** Definition, Types of Environment, Components of environment, Segments of environment, Scope and importance, Need for Public Awareness.	08

	Ecosystem: Definition, Types of ecosystem, Structure of ecosystem, Food Chain, Food Web, Ecological pyramid. Balance Ecosystem. Effects of Human Activities such as Food, Shelter, Housing, Agriculture, Industry, Mining, Transportation, Economic and Social security on Environment, Environmental Impact Assessment, Sustainable Development.	
II	**Natural Resources:** Introduction, Classification. **Water Resources;** Availability, sources and Quality Aspects, Water Borne and Water Induced Diseases, Fluoride and Arsenic Problems in Drinking Water. **Mineral Resources:** Material Cycles; Carbon, Nitrogen and Sulphur cycles. **Energy Resources:** Conventional and Non-conventional Sources of Energy. **Forest Resources:** Availability, Depletion of Forests, Environment impact of forest depletion on society.	**08**
III	**Pollution and their Effects:** Public Health Aspects of Environmental, Water Pollution, Air Pollution, Soil Pollution, Noise Pollution, Solid waste management.	**08**
IV	**Current Environmental Issues of Importance:** Global Warming, Green House Effects, Climate Change, Acid Rain, Ozone Layer Formation and Depletion, Population Growth and Automobile pollution, Burning of paddy straw.	**08**
V	**Environmental Protection:** Environmental Protection Act 1986, Initiatives by Non-Governmental Organizations (NGO's). **Human Population and the Environment:** Population growth, Environmental Education, Women Education.	**08**

Suggested Readings:
1. Dave, Katewa and Singh, "Textbook of Environment and Ecology", Cengage Learning India Pvt. Ltd.
2. Deswal S., "Environmental Studies" Dhanpat Rai & Co.
3. Ahluwalia V.K., "Environmental Studies" TERI Press, New Delhi.
4. Rajgopalan R., "Environmental Studies", Oxford University Press.
5. Singh and Malviya, "Environment & Ecology", Acme Learning.

BBC151: PROBLEM SOLVING USING C LAB	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course, **the student will be able to**	
CO1 Write, compile, debug and execute programs in a C programming environment.	K_3

CO2	Write programs that incorporate use of variables, operators and expressions along with data types.	K_3
CO3	Write programs for solving problems involving use of decision control structures and loops.	K_3
CO4	Write programs that involve the use of arrays, structures and user defined functions.	K_3
CO5	Write programs using graphics and file handling operations.	K_3

1. Program to implement conditional statements in C language.
2. Program to implement switch-case statement in C language
3. Program to implement looping constructs in C language.
4. Program to perform basic input-output operations in C language.
5. Program to implement user defined functions in C language.
6. Program to implement recursive functions in C language.
7. Program to implement one-dimensional arrays in C language.
8. Program to implement two-dimensional arrays in C language.
9. Program to perform various operations on two-dimensional arrays in C language.
10. Program to implement multi-dimensional arrays in C language.
11. Program to implement string manipulation functions in C language.
12. Program to implement structure in C language.
13. Program to implement union in C language.
14. Program to perform file handling operations in C language.
15. Program to perform graphical operations in C language.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

BBC152: COMMUNICATION SKILLS LAB	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to	
CO1	Understanding of basics of listening and writing.	K_2
CO2	Aware about use of reading Newspaper, journals and magazines.	K_3
CO3	Develop skills to face interviews, group discussion, debate and conferences.	K_4

1. Listen and take notes of lecture, Listen and write appropriate words, talks on computers and technology.
2. Self-Introduction, Role Play of celebrities/ politicians/ famous personalities, sharing memorable incidents.
3. Group Discussion.
4. Debate and Extempore.
5. News Paper reading, Journal reading, Magazine reading.
6. Face to face communication.
7. Interviewing techniques.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

BACHELOR OF COMPUTER APPLICATIONS (Three Year Course) BCA Ist Year

BCA
FIRST YEAR SYLLABUS
SEMESTER-II

BBC201: DIGITAL ELECTRONICS		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Apply concepts of Digital Binary System, complements and Binary codes.	K_3
CO 2	Apply the concepts of Boolean Algebra and logic gates.	K_3
CO 3	Understand and implementation of gates.	K_2, K_3
CO 4	Analyze and Design of Combinational logic circuits.	K_4
CO 5	Analysis and design sequential logic circuits with their applications. Implement the design procedure of synchronous and asynchronous sequential circuits.	K_3, K_4

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Binary Systems**: Digital computers and Digital systems, Binary Numbers, Number Base conversion, Octal & Hexa-decimal numbers, Complements, Binary codes.	**08**
II	**Boolean Algebra and Logic Gates**: Basic definitions, Axiomatic definition, Basic theorems and Properties, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates.	**08**
III	**Simplification of Boolean Functions**: The Map method, two, three, four, five and six variable maps, Product of Sums and Sum of Products simplification, NAND and NOR implementation, Other two-level implementations, Don't-Care conditions, The Tabulation method, Determination and selection of Prime-Implicants.	**08**
IV	**Combinational Logic**: Design procedure, Adders, Subtractors, Code conversion, Analysis procedure, Multilevel NAND and NOR circuits, Exclusive-OR and Equivalence Functions, Binary Parallel Adder, Decimal Adder, Magnitude comparator, Decoders, Multiplexers.	**08**
V	**Sequential Logic, Registers and Counters:** Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design procedure, Design of Counters, Design with State Equations, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences.	**08**

Suggested Readings:
1. Mano M., "Digital Logic and Computer Design", Pearson.
2. Mano M., "Digital Design", Prentice-Hall of India.
3. Gaur R.K., "Digital Electronics and Micro-computers", Dhanpat Rai Publications.
4. Jain R.P. "Modern Digital Electronics", McGraw-Hill Education.
5. Malvino A.P. and Leach D.P., "Digital Principles and Applications", McGraw-Hill Education.
6. Rajaraman V. and Radhakrishanan T., "An Introduction to Digital Computer Design", Prentice-Hall India Pvt. Ltd.

7.	Gill N.S. and Dixit J.B, "Digital Design & Computer Organization", University Science Press.

BBC202: DISCRETE MATHEMATICS		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Use mathematical and logical notation to define and formally reason about basic discrete structures such as Sets, Relations and Functions	K_1, K_2
CO 2	Apply mathematical arguments using logical connectives and quantifiers to check the validity of an argument through truth tables and propositional and predicate logic	K_2, K_3
CO 3	Identify and prove properties of Algebraic Structures like Groups, Rings and Fields	K_3, K_4
CO 4	Formulate and solve recurrences and recursive functions	K_3, K_4
CO 5	Apply the concept of combinatorics to solve basic problems in discrete mathematics	K_1, K_3

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Set Theory:** Definition of sets, Venn Diagrams, proofs of some general identities on sets. **Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation, partial ordering relation. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.	**08**
II	**Mathematical Induction:** Piano's axioms, Mathematical Induction Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients.	**08**
III	**Algebraic Structures:** Properties, Semi group, Monoid, Group, Abelian group, Properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.	**08**
IV	**Propositional Logic:** Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers.	**08**
V	**Posets, Hasse Diagram and Lattices:** Introduction, Ordered set, Hasse diagram of partially ordered set, Isomorphic ordered set, Well ordered set, Properties of Lattices and complemented lattices.	**08**
Suggested Readings:		
	1. Tremblay J.P. and Manohar R., "Discrete Mathematical Structures with Application to Computer Science", Tata McGraw Hill. 2. Lipschutz S. and Lipson M., "Discrete Mathematics", Tata McGraw Hill. 3. Rosen K.H., "Discrete Mathematics and its Applications", Tata McGraw Hill. 4. Sarkar S.K., "A Textbook of Discrete Mathematics", S. Chand Publishing. 5. Sharma J.K., "Discrete Mathematics', Trinity Press.	

6. Gupta S.B., "Discrete Mathematics and Structures", University Science Press.

BBC203: DATA STRUCTURE		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	K_1, K_2
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	K_2
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	K_3
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	K_4
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	K_5, K_6

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	**Introduction**: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, Character String in C, Character string operation, Ordered List, Sparse Matrices, and Vectors. Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Recursive definition and processes, Tower of Hanoi Problem, tail recursion, removal of recursion.	**08**
II	**Queues**: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue, Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list.	**08**
III	**Trees**: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary trees, Huffman algorithm. Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.	**08**

IV	**Sorting**: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys. Binary Search Tree (BST): Introduction, Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.	08
V	**Graphs**: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.	08

Suggested Readings:
1. Langsam Y., Augenstin M. and Tannenbaum A., "Data Structures using C and C++", Pearson Education Asia.
2. Horowitz E., Sahni S. and Mehta D., "Fundamentals of Data Structures in C++", Golgotha Book Source, New Delhi.
3. Lipchitz S., "Data Structures", Mc-Graw Hill International.
4. Goyal K. K., Sharma Sandeep & Gupta Atul, "Data Structures and Analysis of Algorithms", HP Hamilton.
5. Tremblay J.P., Sores P.G., "An Introduction to Data Structures with Applications", Tata Mc-Graw Hill International.
6. Salaria R.S., "Data Structures", Khanna Publishing House
7. Berman A.M., "Data structures via C++", Oxford University Press.
8. Weiss W., "Data Structures and Algorithm Analysis in C++", Pearson Education.
9. Patel R.B., "Expert Data Structures with C", Khanna Publishing House.

BBC204: PROFESSIONAL COMMUNICATION	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand	
CO 1	Exhibit adequate Technical and Mass communication skills.	K_1, K_3
CO 2	Understand parts of speech and paragraph development	K_2
CO 3	Demonstrate effective discussion, presentation and writing skills.	K_3, K_5
CO 4	Develop interpersonal communication and listening skills.	K_4
CO 5	Develop confidence and clarity in public speaking projects; be schooled in preparation and research skills for oral presentations.	K_4

DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**
I	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group): Importance of technical communication; Barriers to Communication.	08
II	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct	08

	Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.	
III	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.	**08**
IV	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills: Types; Methods for improving Listening Skills.	**08**
V	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.	**08**

Suggested Readings:
1. Arora V.N. and Chandra L., "Improve your Writing", Oxford Univ. Press.
2. Singh R.P., "Functional skills in Language and Literature", Oxford Univ. Press.
3. Sharma S., "Communication Skills for Engineers and Scientists", PHI Learning Pvt. Ltd.
4. Sharma R.C. and Mohan K., "Business Correspondence and Report Writing", TMH.
5. Mohan K., "Developing Communication skills", Mecra Bannerji- Macmillan India Ltd.

BBC205: INFORMATION SYSTEMS		
Course Outcome (CO)		**Bloom's Knowledge Level (KL)**
At the end of course , the student will be able to understand		
CO 1	Understand the concepts of information systems and its types.	K_2
CO 2	Analyze the basic structure of management information system and its relevance to information systems.	K_3
CO 3	Know the concepts of planning and control in an organization.	K_2, K_3
CO 4	Describe various business applications of information technologies.	K_2
CO 5	Apply the concepts of information technology and management related to CRM and SCM.	K_4
DETAILED SYLLABUS		
Unit	**Topic**	**Proposed Lecture**

I	**Foundation of Information Systems:** Introduction to information system in business, fundamentals of information systems, solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.	**08**
II	**An overview of Management Information Systems:** Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, Concept of an MIS, Structure of a Management information system.	**08**
III	**Concepts of planning & control:** Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization.	**08**
IV	**Business applications of information technology:** Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage.	**08**
V	**Managing Information Technology:** Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes, CRM, SCM.	**08**

Suggested Readings:
1. O'Brien J., Marakas G.M., and Behl R. "Management Information System", McGrawhill Education.
2. Gordon B.D. and Margrethe H.O., "Management Information System", TMH.
3. O'Brian, "Introduction to Information System", McGrawhill.
4. Murdick, "Information System for Modern Management", PHI.
5. Jawadekar W.S. and Dubey S.S., "Management Information System", McGrawhill.
6. Jain Sarika, "Information System", PPM.
7. Kelkar S.A. "Information Systems – A concise Study", PHI.

BBC252: PROFESSIONAL COMMUNICATION LAB	
Course Outcome (CO)	**Bloom's Knowledge Level (KL)**
At the end of course, the student will be able to	
CO1	Develop the ability to work as a team member as an integral activity in the workplace.	K_3
CO2	Increase confidence in their ability to read, comprehend, organize, and retain written information. Improve reading fluency.	K_4
CO3	Write coherent speech outlines that demonstrate their ability to use organizational formats with a specific purpose; Deliver effective speeches that are consistent with and appropriate for the audience and purpose.	K_5, K_6

CO4	Develop proper listening skills; articulate and enunciate words and sentences clearly and efficiently.	K_3
CO5	Show confidence and clarity in public speaking projects; be schooled in preparation and research skills for oral presentations.	K_5

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A).

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

Note: The Instructor may add/delete/modify experiments, wherever he/she feels in a justified manner.

BVA251: SPORTS AND YOGA

Objective of the Course:

- To maintain mental and physical wellness upright and develop ability in the students to cope up with the stress arising in the life.
- To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
- To introduce a practice oriented introductory course on the subject. More involved / advanced course may come up in subsequent years of study.

Syllabus/ Guidelines

Part A: Sports/Games

Some form of Athletics would be compulsory for all students, unless restricted due to medical / physical reasons. In addition to this, student has to opt for at least one game out of the remaining mentioned below.

A fair theoretical knowledge and a reasonable amount of field / site practice of the chosen games will be essential.

1. Athletics   **Compulsory**
2. Volleyball
3. Basketball
4. Handball
5. Football
6. Badminton
7. Kabaddi
8. Kho-kho
9. Table tennis
10. Cricket

Part B: Yoga

a. **Introduction of Yoga**
   Introduction of Yoga, Origin of Yoga, Aims and Objective of Yoga, Patanjali Yoga darshan, Hath yoga, Gheranda Samhita, Karm yoga, Gyan yoga.

b. **Asanas, Pranayam and Meditation Practices**
   Meaning of Asanas, Objective of Asanas, rules and regulations of Asanas and Pranayams, Types of Yogasana.
   Yogic postures: Standing Posture, Sitting posture, Supine posture, Prone posture, balancing Postures, Pranayam according to Patanjali and Hath Yoga, Meditaion Mudras.

c. **Science of Yoga**

   Physiological effects of Asanas- Paranayama and meditation,stress management and yoga, Mental health and yoga practice, Health and Personality Development.

General Guidelines

1. Institutes must assign minimum of three periods in the Time Table for the activities of Sports/Yoga.

2. Institutes must provide field/facility and offer a minimum of five choices of the Games/Sports.

3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

4. Student must be made familiar with the terminologies, rules/regulations, dimension/ marking of the play field/area and general knowledge of national/ international level facts/figures related to the chosen game.

Assessment:

The Institute must assign coordinator/ subject teacher for the subject, for every batch/group of the students, who would be responsible for coordinating the required activities and keep watch on the level of student's participation in the chosen game.

Coordinator/mentor would be responsible for the award of the sessional marks based upon following components.

1. Level of understanding and general awareness   (20 %)

2. Involvements in the Practice Sessions   (50 %)

3. Regularity, Sincerity and Discipline   (20 %)

4. Participation in University level / District level / State level / National Level events   (10 %)