Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
w.e.f Session 2019-2020

SYLLABUS FOR BCA w.e.f Session 2019-2020

Year	Semester	Paper Code	Title of Paper	Internal	External	Total
First year	I	BCA 111	Communicative English	30	70	100
		BCA 112	Basic Mathematics	30	70	100
		BCA 113	Computer Fundamentals	30	70	100
		BCA 114	Introduction to C Language	30	70	100
		BCA 115	Lab: Practical (C & Unix basics)	30	70	100
	II	BCA 211	Discrete Mathematics	30	70	100
		BCA 212	Introduction to C++	30	70	100
		BCA 213	Data Structures	30	70	100
		BCS 214	Digital Electronics	30	70	100
		BCS 215	Lab: Practical (C++)	30	70	100
Second Year	III	BCA 311	Computer System Architecture	30	70	100
		BCA 312	Programming in Python	30	70	100
		BCA 313	Operational Research	30	70	100
		BCA 314	Organizational Behavior	30	70	100
		BCA 315	Lab: Practical (Python)	30	70	100
	IV	BCA 411	Introduction to Database System	30	70	100
		BCA 412	Operating System	30	70	100
		BCA 413	Cloud Computing	30	70	100
		BCS 414	Numerical Analysis and Statistical Techniques	30	70	100
		BCS 415	Lab: Practical (DBMS)	30	70	100
		Environment Science	Students must appear in exam of the Compulsory Paper of "Environmental Sciences" in the 4th Semester.			
Third year	V	BCA 511	Digital Communication and Network	30	70	100
		BCA 512	(a) Java Programming (b) C# with .NET Framework	30	70	100
		BCA 513	Computer Graphics	30	70	100
		BCA 514	Software Engineering	30	70	100
		BCA 515	Lab: Practical (JAVA)/C#	30	70	100
	VI	BCA 611	Artificial Intelligence	30	70	100
		BCA 612	(a) Web Technology (b) Internet of Things	30	70	100
		BCA 613	Cyber Security	30	70	100
		BCA 614	Minor Project	30	70	100
		BCA 615	Lab: Web Technology/ Internet of Things	30	70	100

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 111: Communicative English

Unit I
Communication:
What is Communication, Levels of Communication, Importance, Scope and Process of communication, Essentials of good communication, 7 Cs of communication, Channels of communication, Verbal and Non-Verbal communication, Formal and Informal communication, Barriers to communication.

Unit II
Written Communication:
Objectives of written Communication, Media of written communication, Merits and demerits of written communication. Words and Phrases, Guidelines for Effectiveness, Sentence Construction, Paragraph Development, Essay writing, Precise Writing.

Unit III
Oral Communication:
Principles of effective oral communication, Media of oral communication, Advantages of oral communication, Disadvantages of oral communication, Styles of oral communication.

Unit IV
Oral Forms of Communication:
Effective listening, Active vs. Passive Listening, Effective Presentation Strategies, Effective Use of Visual Aids, Interviews, Types of Interviews, Group Discussion, Meetings, Conferences

Unit V
Written Forms of Communication:
Business letters, Preparation of resume, Office memorandum, Letter writing, Memorandums, E-mails, Report Writing, Technical Proposals.

Recommended Books:
1. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, Sixteenth Impression 2007.
2. High School English Grammar and Composition by Wren & Martin
3. Business Communication by Meenakshi Raman & Prakash Singh, Oxford University Press, Seventh Impression 2008.
4. Technical Writing by B.N.Basu, Prentice-Hall India Pvt. Ltd., 2007

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 112: Basic Mathematics

Unit I
Integral Calculus: Integral as an inverse of Differentiation. Integration by parts. Methods of substitution & use of partial fractions, standard forms and simple examples, Definite integral & their applications to areas and length & Curves.

Unit II
Limits and Continuity: Definition of Limit, Algebra of limits, Right & left-hand limits, Infinite limits, Continuity (Definitions & examples, Algebra of Continuous functions), Differentiability, Rolle's. Mean value theorem with numerical problems.

Unit III
Co-ordinate Geometry: System of lines, System of Circles, Standard equations & properties of parabola & ellipse.

Unit IV
Matrices: Definition, Types of matrices, Laws of operations on matrices, Transpose, adjoint and inverse of matrices, solution of linear system of equations, and Cramer's rule, Rank of Matrices, square Matrices, Eigen values, Eigen Vectors, Characteristic polynomials, Cayley Hamilton theorem.

Unit V
Differential Equation: First order and first-degree differential equations, separation of variables, Homogeneous, linear, exact differential equations, second order linear equations with constant coefficients, Orthogonal trajectories.

Recommended Books:
5. Bansi lal & S. Arora" Two-Dimensional Co-ordinate Geometry" S. chand
6. S.C.Gupta 'Matrices", S. Chand
7. R.S. Agarwal Differential Calculus S. Chand
8. Harikrishna Real Analysis S.Chand

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 113: Computer Fundamentals

UNIT I
Introduction to Computer: Evolution of computers, Generation of Computers, Classification of Computers, Analog Digital and Hybrid Computers, Classification of Computers according to size, Super Computers, Mainframe Computers, Personal Computers (Different Types), Components of Computer System, Advantages and Disadvantages of Computer System, Block Diagram of a Digital Computer, Basic introduction to Input/ Output Devices.

UNIT II
Data Representation: Different number systems and their conversions (Decimal, Binary, Octal, and Hexadecimal), 1'sComplement and 2's complement, Floating Point numbers, Binary arithmetic, Coding Techniques – BCD, EBCDIC, Gray, and Excess-3.

UNIT III
Memory: Memory hierarchy, Registers (Types of Registers), Cache Memory, **Primary Memory** (RAM, how data is stored in a RAM, DRAM and SRAM. ROM (BIOS/ Firmware & Types of ROM). **Secondary Memory** (Hard disk: Structure of a hard disk, how data is stored in a hard disk, concept of tracks, sectors, clusters, cylinders, Various Storage Devices (Magnetic Tape, Floppy Disks, Optical Disks, SD/MMC Memory cards, USB Pen drive).

UNIT IV
Software: Software and its Need, Types of Software: - System software, Application software. Definition of Operating System, History of Operating System, Function of Operating System, OS classification (Batch, Multiprogramming, Multitasking, Multithreading, Multiprocessing, Multiuser, Time sharing, Real time).

UNIT V
High level language and low-level language, Hardware, Firmware, Compiler, Interpreter and Assembler. **Introduction**: Virtual reality, augmented reality, Bluetooth, Wi-Fi, **Network Fundamental**: Categories, Data flow, Topology. **Introduction**: UNIX, Basic Commands

Recommended Books:
1. Fundamentals of Computers- V. Rajaraman
2. Fundamentals of Computers- P. K. Sinha

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 114: Introduction to C Language

UNIT I:
Evolution of C, Programming languages, Structure of a C program, Compiling a C program, Character set in C, Keywords in C, Hierarchy of operators, Basic data types, Qualifiers used with basic data types, Variables in C, Type declaration, Output function, Input function and format specifiers, arithmetic operators, Unary operators, Relational and logical operators.

UNIT II:
if statement, if else statement, for statement, while loop, do while statements, break statements, continue statements, switch statement, goto statement, ternary operators.

UNIT III:
Advantages of arrays, types of arrays, array declaration, array initialization, accessing data from array, array inside the memory, multidimensional arrays. Character arrays, Array overflow, String Variables, Reading & writing strings, string handling functions.

UNIT IV:
Advantages of functions, declaring a function, calling a function, variables, passing arguments to a function, nested functions, passing array to functions, recursion in functions, Call by value and Call by reference. Pointers and function, Array of pointers, Pointer and Strings, Pointer to structure, Pointers within structure, Introduction of Static and Dynamic memory allocation, Dynamic memory allocation, DMA functions, malloc () function, Size of () operator, Function free (), Function realloc ().

UNIT V:
Introduction, File structure, File handling function, File types, Streams, Text, Binary, File system basics, The file pointer, Opening a file, Closing a file, Writing a character, Reading a character, Using fopen( ), getc( ), putc( ), and fclose( ), Using feof( ).

Recommended Books:
1. E. Balagurusamy, "PROGRAMMING IN ANSI C" McGraw-Hill publication, New Delhi
2. Let us C-Yashwant Kanetkar
3. K.R.Venugopal, S.R.Prasad, "Mastering C" McGraw-Hill Education India

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 211- Discrete Mathematics

Unit I
Propositional Logic: Propositions, Logical connectives, Compound propositions, Conditional and biconditional propositions, Truth tables, Tautologies and contradictions, Contrapositive, Logical equivalences and implications, DeMorgan's Laws, Normal forms, Principal conjunctive and disjunctive normal forms, Rules of inference, Arguments, Validity of arguments.

Unit II
Predicate Calculus: Predicates, Statement function, Variables, Free and bound variables, Quantifiers, Universe of discourse, Logical equivalences and implications for quantified statements, Theory of inference, The rules of universal specification and generalization, Validity of arguments.

Unit III
Set Theory: Basic concepts, Notations, Subset, Algebra of sets, The power set, Ordered pairs and Cartesian product, Relations on sets, Types of relations and their properties, Relational matrix and the graph of a relation, Partitions, Equivalence relations, Partial ordering, Poset, Hasse diagram, Lattices and their properties, Sublattices, Boolean algebra, Homomorphism.

Unit IV
Functions: Definitions of functions, Classification of functions, Type of functions, Examples, Composition of functions, Inverse functions, Binary and n-ary operations, Characteristic function of a set, Hashing functions, Recursive functions, Permutation functions.

Unit V
Groups: Algebraic systems, Definitions, Examples, Properties, Semigroups, Monoids, Homomorphism, Sub semigroups and Submonoids, Cosets and Lagrange's theorem, Normal subgroups, Normal algebraic system with two binary operations, Codes and group codes, Basic notions of error correction, Error recovery in group codes.

Recommended Books:

1. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd,
2. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fourth Edition, Pearson Education Asia,

BCA 212: Introduction to C++

UNIT I:
Procedural vs. Object oriented programming, The main function, C++ preprocessors and the <iostream.h> file, C++ input and output with cin and cout. Simple variables, naming simple variables, Integer types, Floating types, Operators, Operator precedence and associativity, Type conversion, symbolic constants, Derived data types, Arrays, strings, structure, reference variables, new and delete operators. Relational expression in C++, relational operators, for loop, while loop, do-while loop, if-else statement, logical operators, conditional operators, switch statements, break and continue statements.

UNIT II:
Defining a function, function prototyping and function calls, function arguments, passing by reference, inline functions, default arguments.

UNIT III:
Defining classes, implementing member functions, class constructor and destructor, this pointer, friend function, examples based on class and object problems. Base classes, derived classes, implementing and using derived classes, virtual base class, types of inheritance. Problem based on multiple inheritance

UNIT IV:
Stream classes, output with ostream class methods, input with cin, introduction with file handling. Memory Leak, Memory Leak Prevention, Smart pointers, unique_ptr.

UNIT V:
Standard Template Library: STL containers containing vectors, list, queue, map, set, hash_map, hash_set. STL algorithms functions: Sorting Algorithms functions: sort, partial_sort. Searching Algorithms functions: binary_search, lower_bound, upper_bound, equal_range. Non-Modifying Algorithms: count, equal, mismatch,search, search_n. Modifying Algorithms functions: copy, copy_n, fill, fill_n,move,transform, generate etc

Recommended Books:
1. E.Balagurusamy: Object oriented programming with C++
2. K.R.Venugopal: Mastering C++
3. Bjarne Stroustrup: The C++ programming language.

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 213: Data Structure

UNIT I
Introduction: Basic Terminology, Data type, Data object, Need of Data Structure, Types of Data Structure, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off.

UNIT II
Arrays, Single and Multidimensional Arrays, address calculation, application of arrays, Linked list: Representation and implementation of Singly Linked Lists, Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to and from Linked Lists, Doubly linked list.

UNIT III
Stacks: Array and linked representation and implementation of stack, Operations on Stacks: Push & Pop, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Recursion: Introduction, recursion in C, example of recursion, recursive functions. Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty. Circular queue, Deques, and Priority Queues.

UNIT IV
Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic expressions, Complete Binary Tree., Traversing Binary trees, Binary Search Tree, searching BST, insertion and deletion in BST. Graph: Basic terminology, Traversal: BFS, DFS. Spanning Tree: Prims, Kruskal Algorithm, Dijkstra's Algorithm.

UNIT V
Searching- Sequential search, binary search. Sorting algorithms with efficiency- Bubble sort, Insertion sort, Merge sort, Quick Sort, Selection Sort

Recommended Books:
1. Data Structures- Seymour Lipschutz
2. Data Structures using C and C++- Tanenbaum

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 214: Digital Electronics

Unit I
Fundamental concepts: Digital Computer and Digital Systems, Binary Numbers, Number Base Conversion, Complements, Binary Codes.

Unit II
Boolean algebra and logic gates: Basic Theorem and Properties of Boolean Algebra, Boolean functions, Canonical and standard forms. Digital logic gates, Simplification of Boolean functions: two and three variable Maps, four variable maps. POS simplification, NAND and NOR Implementation, don't care conditions.

Unit III
Combinational Logic Design: Design procedure, Adders, Subtractors, Code conversion, Binary Parallel adder, Decimal adder, Magnitude Comparator, Decoder, Encoder, Multiplexers, De-Multiplexers, Parity generation and checking.

Unit IV
Sequential Logic Design: Flip-flops: Basic flip-flop, RS, JK, D, T, Triggering of flip-flops, Analysis of clocked sequential circuits, state reduction and assignment, flip-flop excitation tables

Unit V
Registers, Counters and the Memory unit Registers, shift registers, Counters, Asynchronous and synchronous counters, Ripple counters. Memory-RAM, ROM, Programmable logic array (PLA).

Recommended Books:
1. "Modern Digital Electronics" - R.P. Jain
2. Digital logic and Computer design- M. Morris Mano

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 311: Computer System Architecture

UNIT I
Basic Computer Organization and Design: Register Transfer Language, Arithmetic and Logical, micro-operations, Shift micro-operation. Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference instructions, input-output and interrupt. Design of basic computer, Booth algorithm.

UNIT II
Central Processing Unit: Micro programmed control, Control memory, address sequencing, General Register organization, stack organization, Instruction formats, addressing modes, Data transfer and manipulation, Program Control, RISC, CISC.

UNIT III
Input-Output Organization: Peripheral devices, I/O interface, Asynchronous data transfer, Strobe Control, Handshaking Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication.

UNIT IV
Memory Organization: Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware.

UNIT V
Pipelining: Parallel processing, Amdahl's law, Pipelining, Flynn's classification, space-time diagram, speedup ratio, Arithmetic pipeline, Instruction pipeline.

Recommended Books:
1.   M. Mano, Computer System Architecture, Pearson Education 1992
2.   W. Stallings, Computer Organization and Architecture Designing for Performance, 8th
3.   Edition, Prentice Hall of India,2009
4.   M.M. Mano, Digital Design, Pearson Education Asia,2013
5.   Carl Hamacher, Computer Organization, Fifth edition, McGraw-Hill, 2012.

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 312: Programming in Python

UNIT I
Introduction and Overview: Overview of Python Programming: Structure of a Python Program, Elements of Python, Python Interpreter, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings.

UNIT II
Operators and Statements: Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). Creating Python Programs: Input and Output Statements.

UNIT III
Decision making and Branching: Control statements (Branching, Looping, Conditional Statement, Difference between break, continue and pass, default arguments. Defining Functions.

UNIT IV
Classes and Objects: An introduction to object-oriented programming in Python. objects, operator overloading, overriding, special methods. Inheritance, polymorphism and composition.

UNIT V
Iterators and Generators: Iteration protocol, Iterable objects, generators and generator expressions. Use of generators, assertions. Testing and debugging of a python project.

Recommended Books
1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. Python Tutorial/Documentation www.python.or 2015
3. Allen Downey, Jeffrey Elkner, Chris Meyers, how to think like a computer scientist: learning with Python, Freely available online.2012

BCA 313: Operational Research

UNIT I
Introduction to Operations Research: Basics definition, scope, objectives, phases, models and limitations of Operations Research.
Linear Programming Problem: Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions.

UNIT II
Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the steppingstone method and MODI method.
Assignment Problem: Formulation, Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem as assignment problem.

UNIT III
Sequencing models: Solution of Sequencing Problem, Processing n Jobs through 2 Machines, Processing n Jobs through 3 Machines, Processing 2 Jobs through m machines, Processing n Jobs through m Machines.

UNIT IV
Dynamic programming: Characteristics of dynamic programming, Dynamic programming approach for Priority Management, Employment Smoothening, Capital Budgeting, Stagecoach/Shortest Path, Cargo Loading and Reliability problems.

UNIT V
Simulation: Advantages of Simulation, Limitations of Simulation, Monte-Carlo Simulation, Random Numbers.
CPM and PERT: Drawing of networks, Removal of redundancy, Network computations, Free slack, Total slack, Crashing, Resource allocation.

Recommended Books:
1. P. Sankara Iyer," Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.
3. J K Sharma., "Operations Research Theory & Applications, 3e", Macmillan India Ltd, 2007.
4. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

BCA 314: Organizational Behaviour

UNIT I
Fundamentals of Organizational Behaviour: Nature, Scope, Definition and Goals of Organizational Behaviour, Fundamental Concepts of Organizational Behaviour, Models of Organizational Behaviour, Emerging aspects of Organizational Behaviour: TQM, Managing Cultural Diversity, Managing the Perception Process

UNIT II
Attitude Values and Motivation: Effects of employee attitudes Personal and Organizational Values Job Satisfaction Nature and Importance of Motivation Achievement Motive Theories of Work Motivation: Maslow's Need Hierarchy Theory, McGregor's Theory 'X' and Theory 'Y'

UNIT III
Personality: Definition of Personality, Determinants of Personality Theories of Personality – Trait and Type Theories, The Big Five Traits, Myers-Briggs Indicator, Locus of Control, Type A and Type B Assessment of Personality

UNIT IV
Work Stress: Meaning and definition of Stress, Symptoms of Stress Sources of Stress: Individual Level, Group Level, Organizational Level Stressors, Extra Organizational Stressors Effect of Stress – Burnouts Stress Management – Individual Strategies, Organizational Strategies Employee Counselling

UNIT V
Group Behaviour and Leadership: Nature of Group, Types of Groups Nature and Characteristics of team building, Effective Teamwork Nature of Leadership, Leadership Styles Traits of Effective Leaders

Recommended Books:
1. Organizational Behavior Text, Cases and Games- By K. Aswathappa, Himalaya Publishing House, Mumbai, Sixth Edition (2005)
2. Organizational Behavior Human Behavior at Work by J. W. Newstrom, Tata McGraw Hill Publishing Company Limited, New Delhi, 12 th Edition (2007)

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 411: Introduction to Database System

UNIT I
Elements of database system, DBMS and it's architecture, advantages of DBMS, data independence, types of database users, role of database administrator.

UNIT II
Brief overview of hierarchical and network model, relation model (Relations, properties of relational model, keys and entity integrity & referential integrity rules), CODD's rules for referential Model. Entity relationship Model: Entity sets, Relationship sets, Design Issue, Mapping constraints, E-R diagram, weak entity sets, specialization & generalization.

UNIT III
Normalization concepts and update anomalies, Functional dependencies, Normal forms (1NF, 2NF, 3NF, BCNF).

UNIT IV
SQL fundamentals - Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views – Introduction to Distributed Databases and Client/Server Databases

UNIT V
Centralized system, Client-Server systems (Transaction server, Data server), Parallel system (Speedup & Scale up), Parallel database architecture (Shared memory, Shared Disk, Shared Nothing), Distributed System (Structures, Trade-offs), Backup and Recovery, Security and Privacy.

Recommended Books:
1. Date C J, "An Introduction to Database System", Addison Wesley
2. Navathe E, "Database management systems",
3. Silberschatz & Korth, Database system Concepts, TMH
4. Bipin Desai, An Introduction to Database System, Galgotia Pub

BCA 412: Operating System

UNIT I
Introduction: Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine.

UNIT II
Process Management: Processes: Definition, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching – Threads – Concept of multithreads.
Process Scheduling: Definition, Scheduling objectives, Types of Schedulers, Scheduling criteria, Scheduling algorithms: Pre-emptive and Non, pre-emptive, FCFS, SJF, RR, Multiprocessor scheduling: Types, Performance evaluation of the scheduling.

UNIT III
Inter-process Communication: Race Conditions, Critical Section, Mutual Exclusion, Peterson's Solution, The Producer Consumer Problem, Semaphores, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.
Deadlocks: Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.

UNIT IV
Memory Management: Basic Memory Management: Definition, Logical and Physical address map , Memory allocation : Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction , Paging : Principle of operation, Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory, Hardware and control structures, Locality of reference, Page fault, Working Set, Dirty page/Dirty bit, Demand paging (Concepts only), Page Replacement policies : Optimal (OPT), First in First Out (FIFO, Least Recently used (LRU). Thrashing

UNIT V
File and Input/output Systems: Access Methods, Directory and Disk Structure; File System Mounting, File Sharing, File-System Structure and Implementation; Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance; Recovery, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.

Recommended Books:
1. A Silberschatz, P B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India.

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 413: Cloud Computing

UNIT I
Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing, Cloud Architecture, Types of Clouds, Business models around Clouds, Major Players in Cloud Computing, issues in Clouds, Eucalyptus, Nimbus, Open Nebula, Cloud Sim.

UNIT II
Cloud Services: Types of Cloud services, Software as a Service, Platform as a Service, Infrastructure as a Service, Database as a Service, Monitoring as a Service, Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT III
Collaborating Using Cloud Services Email Communication over the Cloud, CRM Management, Project Management, Event Management, Task Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks and Groupware.

UNIT IV
Virtualization for Cloud Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, System VM, Process VM, Virtual Machine monitor, Virtual machine properties, Interpretation and binary translation, HLL VM, Hypervisors, Xen, KVM, VMWare, Virtual Box, Hyper-V.

UNIT V
Security, Standards and Applications Security in Clouds: Cloud security challenges, Software as a Service Security, Common Standards: The Open Cloud Consortium, The Distributed management Task Force, Standards for application Developers, Standards for Messaging, Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Recommended Books:
1. John Rittinghouse& James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Que Publishing, August 2008.
3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.
4. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl

BCA 414: Numerical Analysis and Statistical Techniques

UNIT I
Introduction: Raw material of statistics, ungrouped & grouped frequency distribution. Diagrammatic presentation: Bar diagram, Pie-diagram. Graphical presentation: Histogram, Frequency polygon, Frequency curve, Cumulative frequency curve.

UNIT II
Measures of Central Tendency and Dispersion: Arithmetic Mean, Mode, Median, Geometric Mean, Harmonic Mean, Range, Mean Deviation, Standard Deviation, Skewness and Kurtosis.

UNIT III
Correlation and Regression Analysis: Scatter diagram, Karl Pearson, Spearman and Concurrent deviation methods, Regression Lines, Method of least square.

UNIT IV
Probability & Probability Distribution: Classical, Empirical and axiomatic approach to probability, Addition and multiplicative law of probability, Binomial, Poisson & Normal Distribution

UNIT V
Numerical Methods: Interpolation: Finite difference, Operators Δ, E, Newton Gregory Interpolation for equal intervals, divided difference, Newton's Lagrange's Interpolation for unequal intervals.
Central differences: Gauss Forward, Backward, third formula due to gauss, Stirling & Bessel's formula.
Numerical Differentiation & integration: Numerical differentiation by Newton Gregory formula, general quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Euler-Maclaurin's summation formula.

Recommended Books:
1. Fundamental of mathematical statistics Gupta & Kapoor S.Chand
2. Introduction to Numerical Methods S.S.Shastri   PHI
3. Rajaraman V., "Computer Oriented Numerical Methods", PHI-2004
4. Gerald & Wheatley, "Applied Numerical Analyses", AW-2003

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 511: Digital Communication and Network

UNIT I

Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. back-bone networks- repeaters, hubs, switches, bridges, router and gateways;

UNIT II

Data Communication Fundamentals and Techniques: Analog and digital signal; data-rate limits; digital to digital line encoding schemes; pulse code modulation; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

UNIT III

Error detection techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Multiple Access Protocol and Networks: CSMA/CD protocols; Ethernet LANS; connecting LAN.

UNIT IV

Networks Switching Techniques and Access mechanisms: Circuit switching; packet switching- connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer,

UNIT V

Networks Layer Functions and Protocols: Routing algorithms; Distance vector routing and link state routing, protocol of Internet- IP protocol (IP4, IP6) Transport Layer Functions and Protocols: TCP- Connection establishment and release- three-way handshake.

Recommended Books:
1. B. A. Forouzan: Data Communications and Networking, Fourth edition, THM ,2007
2. S. Tanenbaum: Computer Networks, Fourth edition, PHI, 2002
3. James F. Kurose, Keith W. Ross, "Computer Networking", Pearson Education.
4. Michael A. Gallo, William M. Hancock, "Computer Communications and Networking Technologies", CENGAGE Learning.

BCA 512 (a): Java Programming

UNIT I

Features of java, JDK Environment & tools like (java, javac, appletviewer, javadoc, jdb), OOPs Concepts Class, Abstraction , Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA, Structure of java program, Data types ,Variables ,Operators , Keywords ,Naming Convention, Decision Making (if, switch), Looping(for, while), Type Casting, Array Creating an array Types of Array - One Dimensional arrays - Two Dimensional array, String - Arrays , Methods. – String Buffer class

UNIT II

Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance Simple, Multilevel, Interfaces, Abstract classes and methods, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes, Modifiers and Access Control, Packages Packages Concept Creating user defined packages, Java Built in packages: java.lang->math, java.util->Random, Date, Hashtable, Wrapper classes

UNIT III

Collection Framework, Interfaces - Collection - List - Set - SortedSet - Enumeration - Iterator – ListIterator, Classes - LinkedList - ArrayList - Vector - HashSet

UNIT IV

Exception: Exception types, Using try catch and multiple catch Nested try, throw, throws and finally, Creating user defined Exceptions
File Handling: Stream ByteStream Classes CharacterStream Classes, File IO basics, File operations Creating file Reading file (character, byte) Writing file (character, byte)

UNIT V

Applet: Introduction, Types applet, Applet Life cycle - Creating applet - Applet tag, Applet Classes - Color - Graphics - Font
AWT: Components and container used in AWT, Layout managers, Listeners and Adapter classes, Event Delegation model,
Swing: Introduction to Swing Component and Container Classes

Recommended Books:
1. Margaret Levine Young, "The Complete Reference Internet", TMH
2. Balagurusamy E, "Programming in JAVA", TMH
3. Naughton, Schildt, "The Complete Reference JAVA2", TMH
4. Steven Holzner, "Java2 Black book", dreamtech

BCA 512 (b): C# with .NET Framework

UNIT I

The .NET Framework: Introduction, Common Language Runtime, Common Type System, Common Language specification, The Base Class Library, The .Net class library Intermediate language, Just-in time Compilation, Garbage Collection, Application Installation and Assemblies, Web services, Unified classes.

UNIT II

C# Basics: Introduction, Data Types, Identifiers, Variables and constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System collections, Delegates and Events, Indexes, Attributes, versioning.

UNIT III

C# Using Libraries: Namespace- System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in web application, Error Handling.

UNIT IV

Advanced Features Using C#: Web services, Windows services, messaging, Reflection, COM and C#, Localization.

UNIT V

Advanced Features Using C#: Distributed Application in C#, XML and C#, Unsafe Mode, Graphical Device Interface with C#, CASE Study (Messenger Application)

Recommended Books:
1. Jeffrey Richter, "Applied Microsoft .NET Framework Programming", (Microsoft)
2. Fergal Grimes, "Microsoft .Net for Programmers", (SPD)
3. Balagurusamy, "Programming with C# ", TMH
4. Wiley," Beginning Visual C# 2008",Wrox

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 513: Computer Graphics

UNIT I

Introduction, Basic elements of Computer graphics, Applications of Computer Graphics. Graphics Hardware, Video Display Devices, Architecture of Raster and Random scan display devices, Input devices, Hard-copy devices, Graphics software.

UNIT II

Fundamental Techniques in Graphics, Line Drawing Algorithms: DDA Algorithm, Bresenham's Line algorithm, Circle Generating Algorithms: Midpoint Circle Algorithm. Filled-Area Primitives: Scan-line polygon fill algorithm, Inside-Outside Tests, boundary Fill Algorithm, Flood- Fill algorithm.

UNIT III

Two- Dimensional Geometric Transformations: Basic Transformations- Translation, Rotation, Scaling. Matrix representations and Homogeneous Coordinates, Composite Transformations. Other Transformations: Reflection, Shearing.

UNIT IV

Two-Dimensional Viewing: The Viewing Pipeline, Clipping operations: Point clipping, Line Clipping: Cohen Sutherland line clipping, Liang- Barsky line clipping, Nicholl-lee-Nicholl line clipping, Polygon Clipping: Sutherland-Hedgeman Polygon Clipping, Weiler-Atherton Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.

UNIT V

Three-Dimensional Concepts: 3-D display methods: Parallel projection, Perspective projection, Depth cueing, Visible line and surface identification, Surface rendering.

Recommended Books:
1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd edition Publication Addison Wesley 1990.
2. D.Hearn, Baker: Computer Graphics, Prentice Hall of India 2008.
3. D.F.Rogers Procedural Elements for Computer Graphics, McGraw Hill 1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 514: Software Engineering

UNIT I

Introduction**:** Software Engineering vs. Traditional Programming, System Development Life Cycle (Software Production Process, Conception, Initiation, Analysis Design, Construction, Testing, Implementation). Waterfall Model, Evolutionary Model. Factors affecting Software Development and Maintenance.

UNIT II

Software Project Management: Defining the Problem, developing a Solution Strategy, Planning the Development Process, Measurement of Software Productivity and Quality.

UNIT III

Software Engineering Principles &Tools: Tools of Design (Data Flow Diagrams, Data Dictionary, Decision Tree, Decision Tables), Modularization (Coupling)

UNIT IV

Testing: Testing fundamentals, Unit testing, Blackbox testing, Whitebox testing, Basic Path testing, Control Structure testing, Integration testing.

UNIT V

Software maintenance: Introduction to Software Maintenance, Enhancing Maintainability During Development (analysis Activities, Standards and Guidelines, Design activities, Implementation Activities, Supporting Documents) Managerial Aspects of Software Maintenance (Change Control Board, Change Request summaries, Quality Assurance Activities, Organizing Maintenance Programs).

Recommended Books:
1. R.F.Fairley,, "Software Engineering Concepts", McGraw Hill.
2. R.S.Press Man , "Software Engineering A Practitioners Approach" McGraw Hill.
3. Rajib Mall, "Fundamentals of Software Engineering". PHI.
4. Pankaj Jalote. "An Integrated Approach to Software Engineering", Narosa

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

BCA 611: Artificial Intelligence

UNIT I
Introduction: Introduction to Artificial Intelligence, Background and Applications, AI techniques, Tic Tac-Toe problem, Problem Characteristics.

UNIT II
Problem Solving and Searching Techniques: Problem Characteristics, Production Systems, Water Jug Problem, Control Strategies, Breadth First Search, Depth First Search, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search. 8-Puzzle Problem.

UNIT III
Knowledge Representation: Definition of Knowledge, Knowledge Based Systems, Representation of Knowledge. Introduction to First Order Predicate Logic, Conversion to clausal form, Unification, Resolution Principle.

UNIT IV
Expert Systems: Introduction to Expert Systems, Characteristic Features of Expert Systems, Applications of Expert Systems, Components and Working of Expert Systems.

UNIT V
Introduction to Machine Learning Techniques: Fuzzy Logic, Fuzzy Set, Membership Function, Union, intersection and complement of a fuzzy set, Introduction to Artificial Neural Network, Introduction to Support Vector Machine.

Recommended Books:
1. DAN.W. Patterson, Introduction to A.I and Expert Systems – PHI, 2007.
2. Russell & Norvig, Artificial Intelligence-A Modern Approach, LPE, Pearson Prentice Hall, 2nd edition, 2005.
3. Rich & Knight, Artificial Intelligence – Tata McGraw Hill, 2nd edition, 1991.
4. W.F. Clocksin and Mellish, Programming in PROLOG, Narosa Publishing House, 3rd edition, 2001.

BCA 612 (a): Web Technology

UNIT I

Introduction to HTML: Basics of HTML, formatting and fonts, commenting code, hyperlink, lists, tables, images, forms, Meta tags, Character entities, frames and frame sets, Overview and features of HTML5.

UNIT II

Style Sheets: Need for CSS, Introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

UNIT III

Introduction to JavaScript: JavaScript Variables and Data Types, Declaring Variables, Data Types, Statements and Operators, Control Structures, Conditional Statements, Loop Statements, Object-Based Programming, Functions, Executing Deferred Scripts, Objects, Message box in JavaScript, Dialog Boxes, Alert Boxes, Confirm Boxes, Prompt Boxes, JavaScript with HTML, Events, Event Handlers, Forms, Forms Array.

UNIT IV

PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT V

PHP Database Connectivity: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs.

Recommended Books:

1. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Prentice Hall, 2007
2. JavaScript: The Good Parts by Douglas Crockford
3. HTML5 for Web Designers by Jeremy Keith
4. The Art and Science of CSS: Create Inspirational, Standards-Based Web Designs by Cameron Adams
5. Headfirst PHP & MySQL by Lynn Beighley & Michael Morrison

BCA 612 (b): Internet of Things

UNIT I
Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoTenabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates. Domain Specific IoTs –Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

UNIT II
IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT. Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

UNITIII
Introduction to Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT IV
IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT V
IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework

Recommended Books:
1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.
4. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015

BCA 613: Cyber Security

UNIT 1
Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats: - Cyber Warfare-Cyber Crime-Cyber Terrorism-Cyber Espionage, need for a Comprehensive Cyber Security Policy, need for a Nodal Authority, Need for an International convention on Cyberspace.

UNIT 2
Cyber Security Vulnerabilities and Cyber Security Safeguards: Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT 3
Securing Web Application, Services and Servers: Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

UNIT 4
Intrusion Detection and Prevention: Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

UNIT 5
Cryptography and Network Security: Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPsec.

Recommended Books:
1. Cyber Security by Nina Godbole Sunit Belapure
2. Cybersecurity - Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics by Yuri Diogenes
3. Cryptography and Network Security by Forouzan
4. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws by Dafydd Stuttard

BCA 614: Minor Project

All the students of BCA are required to submit a project-report based on the work done by him/her during the minor project.

SUMMARY/ABSTRACT-All students must submit a summary/abstract separately with the project report. The content should be as brief as is enough to explain the objective and implementation of the project that the candidate is going to take up.

TOPIC OF THE PROJECT- This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

OBJECTIVE AND SCOPE: This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user must be mentioned.

PROCESS DISCRIPTION: The process of the whole software system proposed, to be developed, should be mentioned in brief.

RESOURCES AND LIMITATIONS: The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION: The write-up must end with the concluding remarks- briefly describing innovation in the approach for implementing the Project, main achievements and any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final project Report: Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

Page Specification:
- Left margin - 3.0 cms
- Right margin- 2.0 cms
- Top margin 2.54 cms
- Bottom margin 2.54 cms
- Page numbers - All text pages as well as Program source code listing should be numbered at the bottom center of the pages.

Kumaun University, Nainital, Uttarakhand
BACHELOR OF COMPUTER APPLICATION
Session 2019-2020

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.

Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing. Coding Font size: 10, Courier New, Normal