

BCA (2022-23) Syllabus semester wise with Marks Break-up

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - I	BCA101 T	Programming Principles Using Python	75	25	100	3			3
	BCA102 T	Computer System Architecture	75	25	100	3			3
	BCA103	Introduction to Innovation and Entrepreneurship	75	25	100	3	1		4
	BCA104	Business Communication	75	25	100	3	1		4
	BCA105	Foundation of Mathematics for Computer Applications	75	25	100	3	1		4
	BCA101 P	Practical Lab for Programming Principles Using Python			50			3	2
	BCA102 P	Practical Lab for Computer System Architecture			50			3	2
					600				22

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - II	BCA201 T	Object Oriented Programming Using C++	75	25	100	3			3
	BCA202 T	Concepts of Data Structure	75	25	100	3			3
	BCA203	Management Information System	75	25	100	3	1		4
	BCA204	Introduction to Soft Computing	75	25	100	3	1		4
	BCA205	Discrete Mathematics	75	25	100	3	1		4
	BCA201 P	Practical Lab for Object Oriented Programming Using C++			50			3	2
	BCA202 P	Practical Lab for Data Structure			50			3	2
					600				22

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - III	BCA301 T	JAVA Programming and Dynamic Web Design	75	25	100	3			3
	BCA302 T	Operating System	75	25	100	3			3
	BCA303	Computer Network	75	25	100	3	1		4
	BCA304	Android Programming	75	25	100	3	1		4
	BCA305	Elements of Statistics	75	25	100	3	1		4
	BCA301 P	Practical Lab for Java Programming			50			3	2
	BCA302 P	Practical Lab for Operating System			50			3	2
					600				22

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - IV	BCA401 T	Introduction to DBMS	75	25	100	3			3
	BCA402 T	Design and Analysis of Algorithm	75	25	100	3			3
	BCA403	Software Engineering	75	25	100	3	1		4
	BCA404	Introduction to Cloud Computing	75	25	100	3	1		4
	BCA405	Numerical Methods	75	25	100	3	1		4
	BCA401 P	Practical Lab for DBMS			50			3	2
	BCA402 P	Practical Lab for DAA			50			3	2
					600				22

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - V	BCA501 T	Computer Graphics & Animation	75	25	100	3			3
	BCA502 T	Web & Internet Technologies	75	25	100	3			3
	BCA503	Data Mining	75	25	100	3	1		4
	BCA504	Information Security	75	25	100	3	1		4
	BCA505	Minor Project			50		1	2	2
	BCA506	Viva-Voice on Minor Project			50			2	1
	BCA501 P	Practical Lab for Computer Graphics & Animation			50			3	2
	BCA502 P	Practical Lab for Web & Internet Technologies			50			3	2
				600				21	

Semester	Paper Code	Paper Name	External Marks	Internal Marks	Total Marks	L	T	P	Credits
Semester - VI	BCA601	Theory of Computation	75	25	100	4			4
	BCA602	Artificial Intelligence	75	25	100	3	1		4
	BCA603	Machine Learning	75	25	100	3	1		4
	BCA604	Digital Image Processing	75	25	100	3	1		4
	BCA605	Major Project			150		3	6	5
	BCA606	Presentation/Se minar based on Major Project			50				1
				600				22	

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA101 T	Programming Principles Using Python	3			3

Unit-I

Computer Fundamentals and Problem Solving: Basic Computer Organization: CPU, memory, I/O Units. Problem Solving using Computation, notion of an algorithm.

Unit-II

Introduction to Python Programming: Python interpreter/Python shell, indentation; identifiers and keywords; literals, numbers and strings; operators (Arithmetic, Relational, Boolean, Assignment, Ternary and Bitwise) and expressions.

Unit-III

Creating Python Programs: Input and output statements, control statements (conditional statements, loop control statements, break, continue and pass, exit), defining functions, default arguments, errors and handling exceptions.

Unit-IV

Strings and Lists: String class, built-in functions for string, string traversal, string operators and operations; Lists creation, traversal, slicing and splitting operations, passing list to a function

Unit-V

Object Oriented Programming: Introduction to Object, Class and Method, Standard Libraries, File handling through libraries.

Unit-VI

Built-in data structures: Tuples, Sets, Dictionary, Stacks, and Queues; Sorting and Searching.

Text Books:

1. Downey, A.B., (2015), Think Python–How to think like a Computer Scientist, 3rd edition. O’Reilly Media.
2. Guttag, J.V.(2016), Introduction to computation and programming using Python. MIT Press.
3. Liang, Y.D. (2013), Introduction to programming using Python. Pearson Education.
4. Brown, M. C. (2001). The Complete Reference: Python, McGraw Hill Education.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA102 T	Computer System Architecture	3			3

Unit-I

Introduction: Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

Unit-II

Data Representation and Basic Computer Arithmetic: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers

Unit-III

Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt, Interconnection Structures, Bus Interconnection design of basic computer.

Unit-IV

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, pipelining and parallel architecture.

Unit-V

Memory Organization: Cache memory, Associative memory, mapping.

Unit-VI

Input-Output Organization: Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.

Text Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992
2. Digital Design, M.M. Mano, Pearson Education Asia, 2015
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA103	Introduction to Innovation and Entrepreneurship	3	1		4

Unit-I

Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions - characteristics, traits and behavioral; entrepreneurial challenges.

Unit-II

Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Unit-III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Unit-IV

Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Unit-V

Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Text Books:

1. Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
2. Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Portfolio Penguin
3. Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing
4. Innovation and Entrepreneurship – by Peter Drucker, Harper Collins

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA104	Business Communication	3	1		4

UNIT-I

Means of Communication:

Meaning and Definition – Process – Functions – Objectives – Importance – Essentials of good communication – Communication barriers, 7C's of Communication

UNIT-II

Types of Communication:

Oral Communication:

Meaning, nature and scope – Principle of effective oral communication – Techniques of effective speech – Media of oral communication (Face-to-face conversation – Teleconferences – Press Conference – Demonstration – Radio Recording – Dictaphone – Meetings – Rumour – Demonstration and dramatization – Public address system – Grapevine – Group Discussion – Oral report – Closed circuit TV). The art of listening – Principles of good listening.

UNIT-III

Written Communication

Purpose of writing, Clarity in Writing, Principle of Effective writing, Writing Techniques, Electronic Writing Process.

UNIT-IV

Business Letters & Reports:

Need and functions of business letters – Planning & layout of business letter – Kinds of business letters – Essentials of effective correspondence, Purpose, Kind and Objective of Reports, Writing Reports.

UNIT-V

Drafting of business letters:

Enquiries and replies – Placing and fulfilling orders – Complaints and follow-up Sales letters – Circular letters Application for employment and resume

UNIT-VI

Information Technology for Communication:

Word Processor – Telex – Facsimile(Fax) – E-mail – Voice mail –Internet – Multimedia – Teleconferencing – Mobile Phone Conversation – Video Conferencing –SMS – Telephone Answering Machine – Advantages and limitations of these types.

Topics Prescribed for workshop/skill lab

Group Discussion, Mock Interview, Decision Making in a Group

Referential Books :

- 1) Business Communication – K.K.Sinha – Galgotia Publishing Company, New Delhi.
- 2) Media and Communication Management – C.S. Rayudu – Hikalaya Publishing House, Bombay.
- 3) Essentials of Business Communication – Rajendra Pal and J.S. Korlhalli- Sultan Chand & Sons, New Delhi.
- 4) Business Communication (Principles, Methods and Techniques) Nirmal Singh -Deep &Deep Publications , New Delhi.
- 5) Business Communication – Dr.S.V.Kadvekar, Rawal and Kothavade- Diamond Publications, Pune.
- 6) Business Correspondence and Report Writing – R.C. Sharma, Krishna Mohan – TMH , New Delhi.
- 7) Modern Business Correspondence – L. Gartside – The English Language Book Society and Macdonald and Evans Ltd.
- 8) Business Communication – M. Balasubrahmanyam –Vani Education Books.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA105	Mathematical Foundation for Computer Applications	3	1		4

Unit-I

Basic concepts of set theory: Mathematical logic-introduction, statements, connectives, negation, conjunction, disjunction, statement formulas and truth tables, conditional and bi-conditional statements, tautology, contradiction, equivalence of formulas, duality law-Predicates and Quantifiers, Arguments.

Unit-II

Operations on sets: power set- venn diagram Cartesian product-relations -functions- types of functions - composition of functions.

Unit-III

Matrix algebra: Types of matrices, matrix operations, transpose of a matrix, determinant of matrix, inverse of a matrix, Cramer's rule

Unit-IV

Matrix: Rank of a matrix, normal form, echelon form, Cayley-Hamilton theorem, Eigen values, Eigen Vectors

Unit-V

Differential calculus: Functions and limits, Simple Differentiation of Algebraic Functions, Evaluation of First and Second Order Derivatives, Maxima and Minima

Unit-VI

Integral Calculus: Integral as Limit of Sum, Fundamental Theorem of Calculus(without proof.), Indefinite Integrals, Methods of Integration Substitution, By Parts, Partial Fractions, Reduction Formulae for Trigonometric Functions, Gamma and Beta Functions(definition).

Text Books:

1. B.S. Grewal, "Elementary Engineering Mathematics", 34th Ed., 1998.
2. Shanti Narayan, "Integral Calculus", S. Chand & Company, 1999
3. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company, 9th Revised Edition, 2001.
4. Shanti Narayan, "Differential Calculus", S.Chand & Company, 1998.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA101 P	Programming Principles Using Python			3	2

Practical will be based on the Paper Programming Principles Using Python. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA102 P	Computer System Architecture			3	2

Practical will be based on the Paper Computer System Architecture. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA201 T	Object Oriented Programming Using C++	3			3

UNIT-I

Introduction

Introducing Object – Oriented Approach, Relating to other paradigms {Functional, Data decomposition}.

Basic terms and ideas

Abstraction, Encapsulation, Inheritance, Polymorphism, Review of C, Difference between C and C++ - cin, cout, new, delete, operators.

UNIT-II

Classes and Objects

Encapsulation, information hiding, abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behaviour of an object, Constructors and destructors, instantiation of objects, Default parameter value, object types, C++ garbage collection, dynamic memory allocation, Metaclass / abstract classes.

UNIT-III

Inheritance and Polymorphism

Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Categorization of polymorphism techniques, Method polymorphism, Polymorphism by parameter, Operator overloading, Parameteric Polymorphism

UNIT-IV

Generic function

Template function, function name overloading, Overriding inheritance methods, Run time polymorphism, Multiple Inheritance.

UNIT-V

Files and Exception Handling

Streams and files, Namespaces, Exception handling, Generic Classes

Referential Books:

1. A. R. Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997.
2. S. B. Lippman & J. Lajoie, “ C++ Primer”, 3rd Edition, Addison Wesley, 2000.
3. R. Lafore, “Object Oriented Programming using C++”, Galgotia Publications, 2004
4. D. Parasons, “Object Oriented Programming using C++”, BPB Publication.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA202 T	Concepts of Data Structures	3			3

UNIT-I

Introduction to Data Structure and its Characteristics

Array

Representation of single and multidimensional arrays; Sparse arrays – lower and upper triangular matrices and Tridiagonal matrices with Vector Representation also.

UNIT-II

Stacks and Queues

Introduction and primitive operations on stack; Stack application; Infix, postfix, prefix expressions; Evaluation of postfix expression; Conversion between prefix, infix and postfix, introduction and primitive operation on queues, D- queues and priority queues.

UNIT-III

Lists

Introduction to linked lists; Sequential and linked lists, operations such as traversal, insertion, deletion searching, Two way lists and Use of headers

UNIT-IV

Trees

Introduction and terminology; Traversal of binary trees; Recursive algorithms for tree operations such as traversal, insertion, deletion; Binary Search Tree

UNIT-V

B-Trees

Introduction, The invention of B-Tree; Statement of the problem; Indexing with binary search trees; a better approach to tree indexes; B-Trees; working up from the bottom; Example for creating a B-Tree

UNIT-VI

Sorting Techniques; Insertion sort, selection sort, merge sort, heap sort, searching Techniques: linear search, binary search and hashing

Referential Books:

1. E.Horowitz and S.Sahani, “ Fundamentals of Data structures”, Galgotia Book source Pvt. Ltd., 2003
2. R.S.Salaria, “ Data Structures & Algorithms” , Khanna Book Publishing Co. (P) Ltd.,2002
3. Y.Langsam et. Al., “ Data Structures using C and C++” , PHI, 1999

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA203	Management Information System	3	1		4

Unit – I

Management Information System(MIS): Concept & definition, Role of MIS, Process of Management, MIS-A tool for management process, Impact of MIS, MIS & computers, MIS & the user, IMS- a support to the Management.

Unit – II

Planning & Decision making: The concept of corporate planning, Strategic planning Type of strategic, Tools of Planning, MIS-Business Planning; Decision making concepts, Methods, tools and procedures, Organizational Decision making, MIS & Decision making concepts.

Unit – III

Information &System: Information concepts, Information: A quality product classification of the information, Methods of data & information collection, Value of information, MIS &System concept, MIS & System analysis ,Computer System Design.

Unit – IV

Development of MIS: Development of long range plans of the MIS. Ascertaining the class of information, determining the Information requirement, Development and implementation of the MIS, Management of quality in the MIS, organization for development of the MIS, MIS: the factors of success and failure.

Unit – V

Decision Support System (DSS): Concept and Philosophy, DSS: Deterministic Systems, Artificial intelligence(AI) System, Knowledge based expert system(KBES), MIS & the role of DSS, Transaction Processing System(TPS), Enterprise Management System(EMS), Enterprise Resource Planning (ERP) System, Benefits of ERP, EMS & ERP

Text Books:

1. Management Information System, Jawadekar, W. S.
2. Managing with information, Kanter, Jerome
3. Management Information System, Louden & Louden
4. Information system for Modern Management, Murdick & Ross, R.claggett

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA204	Introduction to Soft Computing	3	1		4

Unit-I

(Introduction) Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-II

(Fuzzy Membership, Rules) Membership functions, interference in Fuzzy Logic, Fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzification & De-Fuzzification, Fuzzy Controller, Industrial applications.

Unit-III

Genetic Algorithm(GA) Basic concepts, Working principle, Procedures of GA, Flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, Applications.

Unit-IV (Introduction & Architecture) Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions.

Unit-V

Neural network architecture: Single layer and Multilayer feed forward networks, Recurrent networks, Learning techniques, Perception and Convergence rule, Auto-associative and hetero-associative memory.

Unit-VI

(Back propagation networks) Architecture: perceptron model, solution, single layer artificial neural network, Multilayer perceptron model; back propagation learning methods, effect of learning rule co-efficient; back-propagation algorithm, factors affecting back-propagation training, applications.

Text Books:

1. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.
2. N. P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press.
3. Simon Haykin, "Neural Networks" Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata McGraw Hill

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA205	Discrete Mathematics	3	1		4

Unit – I

Set Relation And Function : Sets & subsets, set operation, power set, Cartesian product of two sets composition of relation, type of relation, mapping, mathematical function, exponential & logarithmic functions.

Group & fields: Group, sub group, Finite & infinite group, cyclic group, permutation group, homomorphism, isomorphism, automorphism, endomorphism, coset, Field, sub field & Ring.

Unit – II

Mathematical Logic: Statement & Notations, connectives, Normal forms, Theory of inference for the statement calculus, Predicate calculus.

Unit – III

Basic concept of Graph: Basics of Graph, Pseudograph, Multigraph, Simple graph, Bipartite graph and Complete Bipartite graph, Hand Shaking Lemma, Sub graphs, Operations on graph, Walk, Path and Circuits and their properties. Shortest Path Problem.

Unit - IV

Eulerian and Hamiltonian Graph: Unicursal and Eulerian graph, Randomly Eulerian graph, Fleury's Algorithm, Chinese Postman Problem, Hamiltonian Graph, Necessary and Sufficient conditions, Traveling Salesman Problem.

Unit – V

Trees and Spanning Trees: Tree, Properties of tree, Distance, Radius, Diameter of a tree, Spanning tree, Fundamental Circuit, Cayley's Formula for number of spanning tree, Minimal spanning tree : Kruskal's and Prim's Algorithm, Connectivity and Separability.

Unit-VI

Network Flow:

Networks: Flows, Cuts in a Network, Max-flow Min-cut theory, Augmenting path, Ford and Fulkerson algorithm, Edmonds and Karp algorithm, Menger's Theorems.

Text Books:

1. C.L. Liu & Mahopatra, Elements of Discrete mathematics, 2nd Sub Edition 1985, Tata McGraw Hill
2. Rosen, Discrete Mathematics and Its Applications, Sixth Edition 2006
3. J. L. Hein, Discrete Structures, Logic, and Computability, Jones and Bartlett Publishers, 3rd Edition, 2009

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA201 P	Practical Lab for Object Oriented Programming Using C++			3	2

Practical will be based on the Paper Object Oriented Programming Using C++. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA202 P	Practical Lab for Data Structure			3	2

Practical will be based on the Paper Concepts of Data Structure. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA301 T	JAVA Programming and Dynamic Web Design	3			3

UNIT-I

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, package, exception handling) multithreaded programming.

UNIT-II

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar) layout manager, string handling (only main functions)

UNIT-III

Networking (datagram socket and TCP/IP based server socket) event handling, JDBC: Introduction, Drivers, Establishing Connection, Connection Pooling.

UNIT-IV

HTML: use of commenting, headers, text styling, images, formatting text with , special characters, horizontal rules, line breaks, table, forms, image maps, <META> tags, <FRAMESET> tags, file formats including image formats.

UNIT-V

Java Servlets: Introduction, HTTP Servlet Basics, The Servlet Lifecycle, Retrieving Information, Sending HTML Information, Session Tracking, Database Connectivity

UNIT-VI

Java Server Pages: Introducing Java Server Pages, JSP Overview, Setting Up the JSP Environment, Generating Dynamic Content, Using Custom Tag Libraries and the JSP Standard Tag Library, Processing Input and Output.

Referential Books:

1. Patrick Naughton and Herbertz Schildt, "Java-2 The Complete Reference" 199, TMH.
2. Shelley Powers, "Dynamic Web Publishing" 2nd Ed. Techmedia, 1998.
3. Ivor Horton, "Beginning Java-2" SPD Publication
4. Jason Hunter, "Java Servlet Programming" O'Reilly
5. Shelley Powers, "Dynamic Web Publishing" 2nd Ed. Techmedia, 1998
6. Hans Bergsten, "Java Server Pages", 3rd Ed. O'reilly

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA302 T	Operating System	3			3

UNIT-I

Introduction, What is an operating system, Simple Batch Systems, Multi-programmed Batch systems, Time- Sharing Systems, Personal – Computer Systems, Parallel systems, Distributed systems, Real- Time Systems.

Memory Management: Background, Logical versus physical Address space, swapping, Contiguous allocation, Paging, Segmentation

Virtual Memory: Demand Paging, Page Replacement, Page- replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing, Other Considerations

UNIT-II

Processes: Process Concept, Process Scheduling, Operation on Processes

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple – Processor Scheduling.

Process Synchronization: Background, The Critical – Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization

UNIT-III

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT-IV

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices; Input or Output Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap- Space Management, Disk Reliability

UNIT-V

Information Management: Introduction, A Simple File system, General Model of a File System, Symbolic File System, Basic File System, Access Control Verification, Logical File System, Physical File system File – System Interface; File Concept, Access Methods, Directory Structure, Protection, Consistency Semantics File – System Implementation: File – System Structure, Allocation Methods, Free- Space Management

Referential Books:

1. Silberschatz and Galvin, “ Operating System Concepts”, Person, 5th Ed. 2001
2. Madnick E., Donovan J., “ Operating Systems:,Tata McGraw Hill,2001
3. Tannenbaum, “Operating Systems”, PHI, 4th Edition, 2000

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA303	Computer Network	3	1		4

UNIT-I

Basic Concepts: Components of data communication, distributed processing, standards and organizations. Line configuration, topology, Transmission mode, and categories of networks.
OSI and TCP/IP Models: Layers and their functions, comparison of models.
Digital Transmission: Interfaces and Modems: DTE-DCE Interface, Modems, Cable modems.

UNIT-II

Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon capacity, comparison of media

UNIT-III

Telephony: Multiplexing, error detection and correction: Many to one, One to many, WDM, TDM, FDM, Circuit switching, packet switching and message switching.
Data link control protocols: Line discipline, flow control, error control, synchronous and asynchronous protocols, character and bit oriented protocols, Link access procedures.
Point to point controls: Transmission states, PPP layers, LCP, Authentication, NCP.
ISDN: Services, Historical outline, subscriber's access, ISDN Layers and broadcast ISDN.

UNIT-IV

Devices: Repeaters, bridges, gateways, routers, The Network Layer; Design issues, Routing algorithms, Congestion control Algorithms, Quality of service, Internetworking, Network-Layer in the internet.

UNIT-V

Transport and upper layers in OSI Model: Transport layer functions, connection management, functions of session layers, presentation layer and application layer.

Referential Books:

1. A.S.Tanenbaum, "Computer Networks"; Pearson Education Asia, 4th Ed. 2003.
2. Behrouz A.Forouzan, "Data Communication and Networking", 3rd Ed. Tata MCGraw Hill, 2004.
3. William Stallings, "Data and computer communications", Pearson education Asia, 7th Ed., 2002.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA304	Android Programming	3	1		4

Unit-I

Introduction: Review to JAVA & OOPS Concepts, History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture, Android components including activities, view and view group, services, content providers, broadcast receivers, intents, parcels, instance state.

Unit-II

User Interface Architecture: application context, intents: explicit intents, returning results from activities, implicit intents, intent filter and intent resolution, and applications of implicit intents, activity life cycle, activity stack, application's priority and its process' states, fragments and its life cycle.

Unit-III

User Interface Design: Layouts, optimizing layout hierarchies, form widgets, text fields, button control, toggle buttons, spinners, images, menu, dialog.

Unit-IV

Broadcast receivers, notifications and services: Broadcast sender, receiver, broadcasting events with intents, listening for broadcasts with broadcast receivers, broadcasting ordered intents, broadcasting sticky intents, pending intents, creating notifications, setting and customizing the notification tray UI. Create, start, and stop services, binding services to activities, using asynctasks to manage background processing, handler, looper and runnable 112

Unit-V

Database and Content provider: SQLite, Content Values and Cursors, creating SQLite databases, querying a database, adding, updating, and removing rows, Creating Content Providers, implement content provider's queries and its usage.

Text Books:

1. Griffiths, D., & Griffiths, D., (2015). Head First Android Development, O'reilly Media.
2. Meier, R.,(2012). Professional Android™ 4 Application Development. John Wiley & Sons, Inc.
3. Murphy, M. L. (2018). The Busy Coder's Guide to Android Development, Commons Ware
4. Phillips, B., Stewart, C., Hardy, B. & Marsicano, K. (2015). Android Programming: The Big Nerd Ranch Guide. Big Nerd Ranch. Guides.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA305	Elements of Statistics	3	1		4

UNIT-I

Population, Sample and Data Condensation

Definition and scope of statistics, concept of population and simple with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

UNIT-II

Measures of Central Tendency

Concept of central Tendency, requirements of a good measures of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data.

UNIT-III

Measures of Dispersion:

Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation.

UNIT-IV

Permutations and Combinations

Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions). $nPr = n!/(n-r)!$ (without proof). Combinations of 'r' objects taken from 'n' objects. $nCr = n!/(r!(n-r)!)$ (without proof). Simple examples, Applications.

UNIT-V

Sample space, Events and Probability

Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples. Classical definition of probability, Addition theorem of probability without Proof (upto three events are expected). Definition of conditional probability Definition of independence of two events, simple numerical problems.

UNIT-VI

Statistical Quality Control

Introduction, control limits, specification limits, tolerance limits, process and product control; Control charts for X and R; Control charts for number of defective {n-p chart} ,control charts for number of defects {c - chart}

Referential Books:

1. S.C.Gupta - Fundamentals of statistics - Sultan chand & sons , Delhi.
2. D.N.Elhance - Fundamentals of statistics - Kitab Mahal, Allahabad.
3. Montgomery D.C. – Statistical Quality Control - John Welly and Sons
4. Goon, Gupta And Dasgupta - Fundamentals of statistics - The world press private ltd. , Kolkata.
5. Hogg R.V. and Craig R.G. – Introduction to mathematical statistics Ed 4 {1989} – Macmillan Pub. Co. Newyork.
6. Gupta S.P. – Statistical Methods , Pub – Sultan Chand and sons New Delhi

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA301 P	Practical Lab for JAVA Programming and Dynamic Web Design			3	2

Practical will be based on Paper Java Programming & Web Design: on Whole Syllabus

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA302 P	Practical Lab for Operating System			3	2

Practical will be based on the Paper Operating System. On whole syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA401 T	Introduction to DBMS	3			3

UNIT-I

Introduction: Characteristics of database approach, data models, DBMS architecture and data independence.

UNIT-II

E-R Modeling: Entity types, Entity set, attribute and key, relationships, relation types, roles and structural constraints, weak entities, enhanced E-R and object modeling, Sub classes; Super classes, inheritance, specialization and generalization.

UNIT-III

File Organization: Indexed sequential access files; implementation using B & B++ trees, hashing, hashing functions, collision resolution, extendible hashing, dynamic hashing approach implementation and performance.

UNIT-IV

Relational Data Model: Relational model concepts, relational constraints, relational algebra

SQL: SQL queries, programming using SQL.

UNIT-V

EER and ER to relational mapping: Data base design using EER to relational language.

UNIT-VI

Data Normalization: Functional Dependencies, Normal form up to 3rd normal form.

Concurrency Control: Transaction processing, locking techniques and associated, database recovery, security and authorization. Recovery Techniques, Database Security

Referential Books:

1. Abraham Silberschatz, Henry Korth, S.Sudarshan, "Database Systems Concepts", 4th Edition, McGraw Hill, 1997.
2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
3. A.K.Majumdar, P. Bhattacharya, "Database Management Systems", TMH, 1996.
4. Bipin Desai, "An Introduction to database systems", Galgotia Publications, 1991.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA402 T	Design & Analysis of Algorithm	3			3

Unit – I

Introduction: Algorithm, Analysis of algorithm, Designing Algorithm, Mathematical Foundations, Growth of functions, Summation, Recurrence relation, Sets, Counting & Probability.

Unit – II

Divide & Conquer: Searching: Binary search, Sorting: Counting Sort, Radix Sort, Bucket Sort, Selection Sort, Heap Sort, Merge sort, Quick sort, Greedy Methods – Minimum spanning tree, Dijkstra's Algorithm for shortest paths from a single source, Fractional Knapsack problem, Optimal storage on tapes.

Unit – III

Dynamic Programming: Application to various problems (for reference; Weighted Interval Scheduling, Sequence Alignment, Knapsack), their correctness and analysis. Greedy Algorithms: Application to various problems, their correctness and analysis.

Unit – IV

Back Tracking: 8 Queen Problem, Chromatic number, Graph coloring, Coloring of tree.

Unit – V

Branch & Bound: Traveling salesman problem

Unit –IV

Advanced Analysis Technique: Amortized analysis

Books:

1. Kleinberg, J., & Tardos, E. (2013). Algorithm Design. 1st edition. Pearson Education India.
2. Cormen, T.H., Leiserson, C.E. Rivest, R.L., & Stein, C. (2015). Introduction to Algorithms. 3rd edition. PHI.
3. Sarabasse & Gledler A. V. (1999). Computer Algorithm – Introduction to Design and Analysis. 3rd edition. Pearson Education
4. Horowitz & Sahani, (2008) Fundamental of Computer Algorithms: (Second Edition)

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA403	Software Engineering	3	1		4

UNIT-I

Software Engineering: Definition and paradigms, A generic view of software engineering.

UNIT-II

Requirements Analysis: Statement of system scope, isolation of top level processes and entities and their allocation to physical elements, refinement and review.

Analyzing a problem, creating a software specification document, review for correctness, consistency, and completeness.

UNIT-III

Designing Software Solutions: Refining the software Specification; Application of fundamental design concept for data, architectural and procedural designs using software blue print methodology and object oriented design paradigm; Creating design document: Review of conformance to software requirements and quality.

UNIT-IV

Software Implementation: Relationship between design and implementation, Implementation issues and programming support environment, Coding the procedural design, Good coding style and review of correctness and readability.

UNIT-V

Software Maintenance: Maintenance as part of software evaluation, reasons for maintenance, types of maintenance (Perceptive, adoptive, corrective), designing for maintainability, techniques for maintenance.

UNIT-VI

Comprehensive examples using available software platforms/case tools, Configuration Management.

Referential Books:

1. K.K.Aggarwal & Yogesh Singh “Software engineering”, 2nd Ed., New Age International 2005.
2. I.Sommerville, “Software Engineering”, Addison Wesley, 2002.
3. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach” John Wiley & Sons.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA404	Introduction to Cloud Computing	3	1		4

UNIT-I

Computer Networks, basics of networking, Architectures of networking, topologies, types of Networks ,LAN,WAN,MAN, Network Components, Protocols, Communication aspects, basics of internet.

UNIT-II

Client-Server Computing, Cluster Computing, Grid Basics, Distributed Computing. Introduction to Cloud Computing, Introduction to Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS).

UNIT- III

Understanding Google Cloud, Google Apps, Google Compute Engine (GCE) ,Google App Engine. Amazon Services, Amazon Web Services, Amazon EC2.

UNIT-IV

IBM Cloud Computing with its PaaS, IBM as Saas and IBM as IaaS. Red hat Cloud Computing with its PaaS.

UNIT-V

Microsoft Azure Cloud Computing Service- Windows azure platform Services, Windows Azure storage, Windows Azure fabrics.

UNIT-VI

Salesforce Cloud Computing Services Pass, SaaS and IaaS. Heroku and Force.com as PaaS.

Text Books:

1. Mastering Cloud Computing, Buyya, R., Vecchiola, C., Selvi, S.T., McGraw Hill Education; First edition (2017)
2. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra and Geoffrey Fox, Morgan Kaufmann, 2011

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA405	Numerical Methods	3	1		4

UNIT-I

Roots of Equations: Bisections Method, False Position Method, Newton's Raphson Method, Rate of convergence of Newton's method.

UNIT-II

Interpolation and Extrapolation : Finite Differences, The operator E, Newton's Forward and Backward Differences, Newton's dividend differences formulae, Lagrange's Interpolation formula for unequal Intervals, Gauss's Interpolation formula, Starling formula, Bessel's formula, Laplace- Everett formula.

UNIT-III

Numerical Differentiation Numerical Integration : Introduction, direct methods, maxima and minima of a tabulated function, General Quadratic formula, Trapezoidal rule, Simpson's One third rule, Simpson's three-eight rule.

UNIT-IV

Solution of Linear Equation: Gauss's Elimination method and Gauss's Siedel iterative method.

UNIT-V

Solution of Differential Equations: Euler's method, Picard's method, Fourth-order Runge-Kutta method.

Referential Books:

1. Scarbourogh, "Numerical Analysis".
1. Gupta & Bose S.C. "Introduction to Numerical Analysis, "Academic Press, Kolkata, 3. S.S.Shashtri, "Numerical Analysis", PHI

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA401 P	Practical Lab for DBMS			3	2

Practical will be based on the Paper Introduction to DBMS. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA402 P	Practical Lab for DAA			3	2

Practical will be based on the Paper Design and Analysis of Algorithm. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA501 T	Computer Graphics and Animation	3			3

UNIT-I

Introduction: Advantage of Computer Graphics and Areas of Applications, Hardware and Software for Computer Graphics. (Hard Copy, Display Technologies), Random Scan Display System, Video Controller, Random Scan Display Processor, Raster Graphics, Scan Conversion Algorithms (Line, Circle, Ellipse), Area Filling (Rectangle, Ellipse), Clipping (Lines, Circle, Ellipse), Clipping Polygons

UNIT-II

Two dimensional and three dimensional transformations, 2-Dimensional transformation, 2-D Translation, Rotation, Scaling, Homogeneous Coordinates, Reflection, Shear transform, 3-dimensional transformation, 3-D Translation, Rotation Scaling, Reflection, Shear.

UNIT III

The Physical Layer: Functions of Physical Layer, Data and Signals: Analog and Digital signals, Transmission Impairment, Data Rate Limits, Performance, Data Transmission Media: Guided Media, Unguided Media and Satellites, Bandwidth Utilization: Multiplexing and Spreading, Switching: Circuit switching, Message switching & Packet switching, Telephone, Mobile and Cable network for data Communication.

UNIT-IV

Clipping: Window to view port transformation, Clipping, line clipping, Cohen —Sutherland line clipping, Polygon clipping, Sutherland and Gary Hodgman polygon clipping algorithm

UNIT-V

Visible Surface Determination and computer graphics algorithm: Image space and object space techniques, Hidden Surface removal—Depth comparison, Z-Buffer Algorithm, Back-Face Removal, The Painter's Algorithm, Scan-Line Algorithm, Light and Color and different color models (RGB, CMY, YIQ)

UNIT-VI

Animation and virtual reality: Basic Principles of Animation and Types of Animation, Introduction to the flash interface, Setting stage dimensions, working with panels, panel layouts, Layers & Views, Shaping Objects – Overview of shapes, Drawing & Modifying Shapes, Bitmap Images & Sounds, Animation - Principles, Frame by frame animation, tweening, masks, Introduction to virtual reality.

Text Books:

1. Foley, Van Dam, Feiner, Hughes, Computer Graphics Principles & practice, 2000.
2. D.Haran & Baker. Computer Graphics Prentice Hall of India, 1986
3. D.J. Gibbs & D.C. Tsichritz: Multimedia programming Object Environment & Frame work, 2000
4. The Animator's Survival Kit by Richard Williams, November 2009

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA502 T	Web and Internet Technologies	3			3

Unit-I

Introduction: Network address translation, Subnet Masking, Difference between Intranet and Internet, Working of Internet, Dynamic and Static Routing, Domain Name Server , networking tools - ipconfig, ping, netstat, traceroute 53

Unit-II

Introduction to Internet Protocols: HTTP, HTTPS, FTP, SMTP, IMAP, POP3, VoIP

Unit-III

Web Servers: Introduction, Working, Configuring, Hosting and Managing a Web server, Proxy Servers: Introduction, Working, Type of Proxies, setting up and managing a proxy server Client-side Technologies, Server-side Technologies and hybrid technologies

Unit-IV

Javascript, jQuery, JSON, NODE.js, BOOTSTRAP, Introduction to forums, blogging, portfolio, developing a responsive website, Combining Web Applications and Mobile Applications

Unit-V

Search Engines - components, working, optimization, Crawling, BOTS

Unit-VI

Introduction to cookies and sessions, Introduction to e-commerce websites and e-carts.

Text Books:

1. DComer. (2018). The Internet Book: Everything You need to know about Computer networking and how the internet works. 5th edition. CRC Press.
2. Patel, B & Barik, L.B , Internet & Web Technology , Acme Learning Publisher
3. Bayross, I. (2013). Web enabled commercial application development using HTML, JavaScript, DHTML and PHP. 4th edition. BPB Publication.
4. Godbole, A. S.& Kahate A (2008). Web Technologies. Tata McGrawHill

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA503	Data Mining	3	1		4

Unit-I

Introduction to Data Mining: Applications of data mining, data mining tasks, motivation and challenges, types of data attributes and measurements, data quality.

Data Pre-processing - aggregation, sampling, dimensionality reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation.

Unit-II

Classification: Basic Concepts, Decision Tree Classifier: Decision tree algorithm, attribute selection measures, Nearest Neighbour Classifier, Bayes Theorem and Naive Bayes Classifier, Model Evaluation: Holdout Method, Random Sub Sampling, Cross-Validation, evaluation metrics, confusion matrix.

Unit-III

Association rule mining: Transaction data-set, Frequent Itemset, Support measure, Apriori Principle, Apriori Algorithm, Computational Complexity, Rule Generation, Confidence of association rule.

Unit-IV

Cluster Analysis: Basic Concepts, Different Types of Clustering Methods, Different Types of Clusters, K-means: The Basic K-means Algorithm, Strengths and Weaknesses of K-means algorithm, Agglomerative Hierarchical Clustering: Basic Algorithm, Proximity between clusters, DBSCAN: The DBSCAN Algorithm, Strengths and Weaknesses.

Text Books:

1. Han, J., Kamber, M., & Jian, P. (2011). Data Mining: Concepts and Techniques. 3rd edition. Morgan Kaufmann
2. Tan, P.-N., Steinbach, M., & Kumar, V. (2005). Introduction to Data Mining. 1st Edition. Pearson Education.
3. Hand, D., & Mannila, H. & Smyth, P. (2006). Principles of Data Mining. Prentice-Hall of India.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA504	Information Security	3	1		4

Unit-I

Introduction: Security Concepts, Challenges, Security architecture, Security attacks, security services, security mechanisms

Unit-II

Error detecting/correction: Block Codes, Generator Matrix, Parity Check Matrix, Minimum distance of a Code, Error detection and correction, Standard Array and syndrome decoding, Hamming Codes

Unit-III

Cryptography: Encryption, Decryption, Substitution and Transposition, Confusion and diffusion, Symmetric and Asymmetric encryption, Stream and Block ciphers, DES, cryptanalysis. Public-key cryptography, Diffie-Hellman key exchange, man-in-the-middle attack Digital signature, Steganography, Watermarking.

Unit-IV

Malicious software's: Types of malwares (viruses, worms, trojan horse, rootkits, bots), Memory exploits - Buffer overflow, Integer overflow

Unit-V

Security in Internet-of-Things: Security implications, Mobile device security - threats and strategies.

Text Books:

1. Stallings, W. (2018). Cryptography and network security. 7th edition. Pearson Education.
2. Pfleeger, C.P., Pfleeger, S.L., & Margulies, J. (2015). Security in Computing. 5th edition. Prentice Hall
3. Whitman M.E., & Mattord H.J. (2017). Principle of Information Security. 6th edition. Cengage Learning.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA505	Minor Project		1	2	2

Evaluation will be based on Summer Training held after fourth semester and will be Conducted by the college committee only.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA506	Viva-Voce on Minor Project			2	1

The viva will be conducted based on summer training of **four weeks after the end of fourth Semester** and will be Conducted by the college committee only.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA501 P	Practical Lab for Computer Graphics & Animation			3	2

Practical will be based on the Paper Computer Graphics & Animation. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA502 P	Practical Lab for Web & Internet Technologies			3	2

Practical will be based on the Paper Web & Internet Technologies. On whole Syllabus.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA601	Theory of Computation	3	1		4

Unit-I

Languages: Alphabets, string, language, basic operations on language, concatenation, union, Kleene star.

Unit-II

Regular Expressions and Finite Automata: Regular expressions, Deterministic finite automata (DFA).

Unit-III

Regular Languages: Non-deterministic Finite Automata (NFA), relationship between NFA and DFA, Transition Graphs (TG), properties of regular languages, the relationship between regular languages and finite automata, Kleene's Theorem.

Unit-IV

Non-Regular Languages and Context Free Grammars: Pumping lemma for regular grammars, Context-Free Grammars (CFG),

Unit-V

Context-Free Languages (CFL) and PDA: Deterministic and non-deterministic Pushdown Automata (PDA), parse trees, leftmost derivation, pumping lemma for CFL, properties of CFL.

Unit-VI

Turing Machines and Models of Computations: Turing machine as a model of computation, configuration of simple Turing machine, Church Turing Thesis, Universal Turing Machine, decidability, halting problem.

Text Books:

1. Cohen, D. I. A. (2011). Introduction to Computer Theory. 2nd edition. Wiley India.
2. Linz, P. (2016). An Introduction to Formal Languages and Automata. 6th edition. Jones and Bartlett Learning.
3. Lewis & Papadimitriou (1997), Elements of the theory of computation – 2nd Edition PHI

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA602	Artificial Intelligence	3	1		4

Unit-I

Introduction: Introduction to artificial intelligence, background and applications, Turing test, rational agents, intelligent agents, structure, behavior and environment of intelligent agents, Ethics in AI.

Unit-II

Knowledge Representation: Propositional logic, first order predicate logic, resolution principle, unification, semantic nets, conceptual dependencies, frames, scripts, production rules, conceptual graphs.

Unit-III

Reasoning with Uncertain Knowledge: Uncertainty, non-monotonic reasoning, truth maintenance systems, default reasoning and closed world assumption, Introduction to probabilistic reasoning, Bayesian probabilistic inference, introduction to fuzzy sets and fuzzy logic, reasoning using fuzzy logic.

Unit-IV

Problem Solving and Searching Techniques: Problem characteristics, production systems, control strategies, breadth first search, depth first search, hill climbing and its variations, heuristics search techniques: best first search, A* algorithm, constraint satisfaction problem, means-end analysis.

Unit-V

Game Playing: introduction to game playing, min-max and alpha-beta pruning algorithms. Prolog Programming: Introduction to Programming in Logic (PROLOG), Lists, Operators, basic Input and Output.

Unit-VI

Understanding Natural Languages: Overview of linguistics, Chomsky hierarchy of grammars, parsing techniques.

Text Books:

1. Russell, S.J. & Norvig, P. (2015) Artificial Intelligence - A Modern Approach. 3rd edition. Pearson Education
2. Rich, E. & Knight, K. (2012). Artificial Intelligence. 3rd edition. Tata McGraw Hill
3. Patterson, D.W. (2015). Introduction to Artificial Intelligence and Expert Systems. 1st edition. Pearson Education.
4. Bratko, I. (2011). Prolog Programming for Artificial Intelligence. 4th edition. Pearson Education

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA603	Machine Learning	3	1		4

Unit 1

Introduction: Basic definitions, Hypothesis space and inductive bias, Bayes optimal classifier and Bayes error, Occam's razor, Curse of dimensionality, dimensionality reduction, feature scaling, feature selection methods.

Unit 2

Regression: Linear regression with one variable, linear regression with multiple variables, gradient descent, logistic regression, over-fitting, regularization. performance evaluation metrics, validation methods.

Unit 3

Classification: Decision trees, Naive Bayes classifier, k-nearest neighbor classifier, perceptron, multilayer perceptron, neural networks, back-propagation algorithm, Support Vector Machine (SVM), Kernel functions.

Unit 4

Clustering: Approaches for clustering, distance metrics, K-means clustering, expectation maximization, hierarchical clustering, performance evaluation metrics, validation methods.

Text Books:

1. Mitchell, T.M. (2017). Machine Learning. McGraw Hill Education.
2. Flach, P. (2015). Machine Learning: The Art and Science of Algorithms that Make Sense of Data. Cambridge University Press.
3. Haykins, S.O. (2010). Neural Networks and Learning Machines. 3rd edition. PHI.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA604	Digital Image Processing	3	1		4

Unit-I

Introduction: Digital Image Fundamentals: Brightness, Adaptation and Discrimination, Light and Electromagnetic Spectrum, Image Sampling and Quantization, Some Basic Relationships between Pixels
Types of images.

Unit-II

Spatial Domain Filtering: Some Basic Intensity Transformation Functions, Histogram Equalization, Spatial Correlation and Convolution, Smoothing Spatial Filters: Low pass filters, Order Statistics filters; Sharpening Spatial Filters: Laplacian filter

Unit-III

Filtering in Frequency Domain: The Discrete Fourier Transformation (DFT), Frequency Domain Filtering: Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D).

Unit-IV

Image Restoration: Image Degradation/Restoration Process, Noise models, Noise Restoration Filters
Image Compression: Fundamentals of Image Compression, Huffman Coding, Run Length Coding, JPEG.

Unit-V

Morphological Image Processing: Erosion, Dilation, Opening, Closing, Hit-or-Miss Transformation, Basic Morphological Algorithms.

Unit-VI

Image Segmentation: Point, Line and Edge Detection, Thresholding, Region Based Segmentation.

Text Books:

1. Gonzalez, R. C., & Woods, R. E. (2017). Digital Image Processing. 4th edition. Pearson Education.
2. Jain, A. K. (1988). Fundamentals of Digital Image Processing. 1st edition Prentice Hall of India.
3. Castleman, K. R. (1995.). Digital Image Processing. 1st edition. Pearson Education
4. Gonzalez, R. C., Woods, R. E., & Eddins, S. (2004). Digital Image Processing using MATLAB. Pearson Education Inc.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA605	Major Project		3	6	5

Evaluation will be based on held after fourth semester and will be Conducted by the College/University committee only.

Bachelors of Computer Application

Course Code	Course Name	L	T	P	C
BCA606	Presentation/Seminar based on Major Project				1

Presentation/Seminar based on Major Project will be evaluated by external examiner only.