Courses of Studies

(Under CBCS)

For B.C.A. Programme

in

Artificial Intelligence

(Syllabus of Courses Effective from the Academic Year: 2022-23)

PARISHKAR COLLEGE OF GLOBAL EXCELLENCE AUTONOMOUS

Syllabus of Courses to be offered

(Core courses, Department Elective Courses and Open Elective Courses)

Preamble

The objective of this programme is to prepare the students for the society at large. Parishkar College of Global Excellence visualize all its programmes in the best interest of their students and in this endeavour, it offers a new vision to all its Under-Graduate course. we have adopted an approach that has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice. The Under-Graduate Programmes will prepare the students for both, academia, and Professional. They will be able to Understand Operative and ethical and Professional Responsibility.

The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice and skills for employability. In short, each programme prepares students for sustainability and life-long learning.

The new curriculum of Bachelor of Computer Applications (Artificial Intelligence) offers students' core papers that help build their foundation in computer science. The choice of generic electives and skill enhancement courses enable students to pursue an area of their interest in the field of computer science and application. The contents of each course have been carefully designed to prepare students with knowledge and skill sets that will not only make them industry ready but also foster entrepreneurial and innovative thinking. The new curriculum of Bachelor of Computer Applications (Artificial Intelligence) is structured in a way that the students acquire in depth knowledge in data science and analysis. The comprehensive curriculum design bestows excellent career opportunities to explore new vistas in present competitive corporate arena. It offers students core papers that help build their foundation in the corporate as well as Government sector. The choice of general electives and skill enhancement courses enable students to pursue an area of their interest it the field of computer science. The contents of each course have been carefully designed to prepare students with knowledge and skill sets that will not only make them industry ready but also foster innovative thinking.

CREDIT DISTRIBUTION FOR BCA (ARTIFICIAL INTELLIGENCE)

S.No.	Course	Credits	Total Credits	
1.	Core Paper-12	6	12× 6	72
2.	Ability Enhancement - 2	4	2 × 4	8
3.	Skill Enhancement - 4	4	4 × 4	16
4.	Discipline Elective Course - 4	6	4 × 6	24
5.	General Elective Course - 4	6	2× 6	12
		Total		**134**

SUBJECT SCHEME:

Semester	Subject 1 (Credit-6)	Subject 2 (Credit-6)	Ability Enhancement (Credit-4)	Skill Enhancement (Credit-4)	DSE Paper (Credit-6)	GE Paper (Credit-6)
I	Discrete Structure	Introduction to Programming	English Communication	Introductory Computer Skill		
II	Understanding Computer System	Introduction to Python Programming		Mathematical & Computational Thinking		Introduction to Data Science
III	Data Structure	Fundamentals of Artificial Intelligence		Professional & Leadership & Management	Applied Math for Machine Learning	
IV	Computer Network	Design and Analysis of Algorithms		Industry Exposure (Big Data Analytics)	Introduction to Machine learning	
V	Database Management System	Software Engineering			Introduction to Deep Learning	Python for Data Science
VI	Introduction to Virtualization and Cloud Computing	Information Security and Cyber laws	Environmental Science		Project Work / Dissertation	

BCA

(Artificial Intelligence)

DISCRETE STRUCTURE

UNIT I: Introduction

Sets - finite and Infinite sets, uncountably Infinite Sets; Functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion, Matrices.

UNIT II: Logic & Proofs

Propositional Logic, Propositional Equivalences, Predicates & Quantifiers, Inference Theory, Introduction to Proofs, Normal forms, Proof Methods & Strategy

UNIT III: Algorithms, the Integers

Algorithms, Growth of Functions, Complexity of Algorithms, Summation formulas and properties, Bounding Summations, approximation by Integrals, Number Theory, Matrices

UNIT IV: Recurrences

Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem

UNIT V: Graph Theory

Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Colouring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees

Recommended Books:

1. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition, McGraw Hill 2006
2. C.L. Liu, D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition, Tata McGraw Hill, 1985,
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009
4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms, John Wiley Publication, 1988
5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009
6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

INTRODUCTION TO PROGRAMMING

UNIT I: Introduction to Computer

Introduction, Basic block diagram and functions of various components of computer, Concept of Hardware and Software, Types of software, Compiler, and Interpreter

UNIT II: Introduction to Programming

Basic Difference between Procedure Oriented Language and Object-Oriented Language, Concepts of Machine level, Assembly level and High-level programming, Flow charts and Algorithms

UNIT III: Control Structures & Functions

Simple statements, Decision making statements, looping statements, Nesting of control structures, break and continue statement, goto statement, Concept of user defined functions, prototype, definition of function, parameters, parameter passing, calling a function, Macros, Pre-processing

UNIT IV: Arrays

Concept of array, One- and Two-dimensional arrays, declaration and initialization of arrays, String, String storage, Built-in string functions

UNIT V: Programming with Scratch

Downloading & Installation of Scratch, Introduction Scratch & its environments, Basic components of Scratch Window. Create Scratch Program & Sprite programming. Scratch Block category, Repeating block, For Logic: Control blocks, animate name in Scratch, add sound in your Script, changing look, Colour & size of Script, Working with Multiple Sprite.

Reference Books:

1. Let us C, Yashwant Kanitkar
2. C: The Complete Reference, Herbert Schildt, McGrawHill
3. Computer fundamentals and Programming in C, Pradip dey and Manas Ghosh, Oxford
4. http://scratch.mit.edu

ENGLISH COMMUNICATION

UNIT I

Essential English Vocabulary of day-to-day life (around 1500 words) and Basic Grammar usage for Spoken English}

- Parts of the speech (noun, pronoun, adjective, adverb etc.)
- Types of the sentences (affirmative, negative, interrogative- Y/N, Wh.)
- Use of is, are, am, do, does, did, has, have, had, has been, had been, will etc.
- Use of may, might, can, could, would, should, must etc. [To express invitation, request, gratitude, asking for information, seeking permission etc.]
- Use of a, an, the
- Use of in, into, at, over, above etc.
- Some special constructions like feel like going to, had better, used to, as if, be, get, let etc

UNIT II

- Speaking Practice (Solo/Monologue)
    1) Greeting and Self-introduction
    2) Daily routine
    3) My family
    4) My village/city
    5) My school/College
    6) My hobby
    7) My favourites etc.
- Speaking Practice (Dialogue/Group Discussion/Public Speech)
- Listening Practices {Storytelling and listening, listening to recorded conversations, loud reading, Mock interviews, listening to English news, listening speeches, and watching English movies with subtitles (as homework, self-study material)}
- Translating sentences from Hindi to English and vice versa.

UNIT III

Writing Skills: Letter Writing, Report Writing, Email Writing, Answer writing

UNIT IV

- Theory of communication: Types and modes of communication
- (Verbal Communication. Non-Verbal Communication. Visual Communication)

UNIT V

Language of communication: Personal, Social and Business Communication; Intra-personal, Interpersonal and Group Communication; Barriers and Strategies of Communication

Note: The units I and II of the Spoken English part should be learned collectively. Daily students should learn small grammar topic, 20 essential words and one module of speaking practice in the institute or learning at home.

INTRODUCTORY COMPUTER SKILLS

UNIT I

Computer Fundamental: Introduction to Computer, Definition, Characteristics, History & Generation, Hardware & Software, Uses of Computer, Input & Output Devices, Computer Memory, Types of Windows, Windows Concept Features (Desktop, Taskbar, Start Menu, My Computer, Recycle bin) Windows Accessories (Calculator, Notepad, Paint, Word Pad, Character Map, Windows Explorer, Entertainment, System Tools, Communication) DOS Commands (Internal & External).

UNIT II

Software Packages: Types of Office Suite, MS-Office (MS-Word, MS-Excel, MS-PowerPoint, Outlook), MS-Word (Ribbon & Tabs, Quick Access Toolbar, Proofing Features, Modify Page Layout, Mail-Merge, Drop-Cap), MS-Excel (Concept of Worksheet & Workbook, Formulas, Charts, Graphs, Pivot table, Macros), Power-Point (Create Presentation, Insert Picture & Clipart, Animation & Transition, Slide Effects, Slide Layout), Outlook (Introduction to Outlook), Latest versions of MS-Office

UNIT III

Networking Concept: Introduction to Networking, Network Strategies, LAN, WAN, MAN, Transmission Media (Wired, Wireless), Networking Devices, IP Addresses, MAC Address, Cyber Security and Awareness (Type of Cyber threats, How to Identify Safe website and Portal).

UNIT IV

Introduction to Web Technologies, World Wide Web, Elements of the Web, Browsers, Search Engine, Mails, News and Chat, Security and privacy issues (Cookies, firewalls, executable applets and scripts, blocking system), Audio & Video Streaming, Subscription, *E-Commerce* (Digital Payment & Platforms, Mobile Communication, Digital Signature, Host and Join online meetings on Google Meet and Zoom.

UNIT V

MS-Access (table, queries, forms, reports), Creating and editing Database, customizing tables, linking tables, designing, and using forms, Consumer Complaint Portals, RTI, Introduction to E-Mitra Working, Online Reservation (IRCTC, Airlines, Buses)

Suggested Readings:

1. P.K Sinha, "Computer Fundamentals", BPB Publications.
2. Raja Raman, Fundamentals of Computers, Fourth edition, Prentice Hall India Pvt. Limited.
3. Peter Norton, "Introduction to Computers", 4th Edition, TMH Ltd.
4. B. Ram," Computers Fundamentals", New Age International Publications, New Delhi.

SEMESTER – II

UNDERSTING COMPUTER SYSTEM

UNIT I
Introduction to digital electronics and computer arithmetic
Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units. Number systems, complements, fixed and floating-point representation, character representation, addition, subtraction, magnitude comparison, and multiplication and division algorithms for integers

UNIT II
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 III
Central Processing Unit / Memory Organization / Input-Output Organization ()
Register organization, arithmetic and micro-operations, stack organization, micro programmed control. Instruction formats, addressing modes, instruction codes, machine language, assembly language, input output programming, RISC, CISC architectures, Cache memory, Associative memory, mapping. Input / Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels.
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Hardwired and micro-programmed design approaches, Case study - design of a simple hypothetical CPU.

UNIT IV
Introduction to Operating System
Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems. Processor and user modes, kernels, system calls and system programs.

UNIT V
Process & Memory Management
System view of the process and resources, process abstraction, process hierarchy, threads, threading issues, thread libraries; Process Scheduling, non-pre-emptive and pre-emptive scheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter- process communication; deadlocks, Physical and virtual address space; memory allocation strategies -fixed and variable partitions, paging, segmentation, virtual memory.

Recommended Books:
1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, John Wiley Publications 2008. Edition,
2. A.S. Tanenbaum, Modern Operating Systems, 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 , Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.
6. M. Mano, Computer System Architecture, Pearson Education 1992

INTRODUCTION TO PYTHON PROGRAMMING

UNIT I

Basic of Computer: Fundamental ideas in computer science, Functional components of computer, Classification of computer. Introduction to Problem solving: Analysing a problem, designing algorithm and representation of algorithm using flow chart and pseudo code.

UNIT II

Basic of Python Programming: Installing Python(3.x version); installing IDE, Structured programming concepts; a simple "Parishkar Global Excellence College" program, print statement, basic syntax, interactive shell, editing, saving, and running a script; The concept of data types; variables, assignments; numerical types; operators & types; expressions; comments in the program; understanding error messages(syntax error, run-time error and logical error; Control statements: if-else, loops (for, while), Difference between break, continue ; function, Recursive functions, simple programs

UNIT III

Strings: Introduction; Traversing a String; String Operators Traversal operations, String manipulations: subscript operator, indexing, slicing a string; String functions/methods; strings and number system: converting strings to numbers and vice versa.

UNIT IV

Lists ,Tuples & Dictionaries   : List: Manipulation, Creating and Accessing Lists, List Operations Basic list operators, replacing, inserting, removing an element; List function & methods, Nested List , Searching lists; Working with Lists: Appending element to a list, Inserting an element in a List, Modifying/Updating elements to a List, Deleting an element from a List, **Tuple:** Creating and accessing tuples, Tuple Operation, Tuple functions & methods, Nested Tuples, **Dictionaries**: Creating, Accessing elements of Dictionary ,add an item, modify an item in a dictionary.

UNIT V

Object Oriented Concepts & File Handling: OOPs: Classes, Objects, Inheritance, Polymorphism, operator overloading, **File**: file modes, Binary files Reading/Writing files and number from/to a file, Creating, Opening, Closing, Renaming, Accessing and deleting files, Reading and writing files.

Recommended Books:

1. "Fundamentals of Python: First Programs" Kenneth Lambert, Course Technology, Cengage Laring 2012
2. Computer Programming in Python," E. Balaguruswami, McGraw Hill
3. Head First with Python O'Reillay publication by Paul Barry
4. Programming in Python 3: A complete Introduction to the Python Language, Mark Summerfield ,Pearson
5. "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus",By Charles Dierbach, John Wiley & Sons, December 2012,
6. http://nptel.ac.in/course/106

MATHEMATICAL AND COMPUTATIONAL THINKING

UNIT I

Fundamentals of Mathematics

Number line and Number system, Units and measurement, 3-D geometry and angles, Simple Expression and Equation, Work, Distance and Time, Profit and Loss, Mean and Median

UNIT II

Introduction and Descriptive Statistics for Exploring Data

Pie Chart, Line chart, Scatter plot, Bar Graph, Confidence Interval, Providing Context is Key for Statistical Analyses, Pitfalls when Visualizing Information

UNIT III

Producing Data and Sampling

Introduction, Population V/S Samples, their real-world use in conducting analysis and research, Simple Random Sampling and Stratified Random Sampling, Bias and Chance Error, Variance, Observation vs. Experiment, Confounding, and the Placebo Effect, The Logic of Randomized Controlled Experiments, Distributions in Graphical format (Histograms and density plots)

UNIT IV

Understanding Visualization

Graphical Integrity (Is the information represented trustable?), Graphical heuristics: Lie Factor and Spark Lines (Edward Tufte), Data Density, Small Multiples, Graphical heuristics: Data-ink ratio (Edward Tufte), Graphical heuristics: Chart junk (Edward Tufte), The Truthful Art (Alberto Cairo) {Give as self-study content / Reference material}, Dark Horse Analytics (Optional) {Used as source of Case studies}, Graphics Lies, Misleading Visuals

UNIT V

Mathematics in Various Branch

Climatology and Meteorology, Relativity and Cosmology, Microbiology and Genomics, Crystal and Lattice Structures, Optics and Gravity, Financial Mathematics, Neuroscience

INTRODUCTION TO DATA SCIENCE

UNIT – I

What is Data Science
- Define data science and its importance in today's data-driven world
- Summarize advice given by seasoned data science professionals to data scientists who are just starting out.
- Describe the various paths that can lead to a career in data science.
- Explain why data science is considered the most in-demand job in the 21st century.

UNIT – II

Tools for Data Science
- Describe the languages, tools, and data used by data scientists, including IBM tools focused on data science.
- Create and manage source code for data science in GitHub.
- Describe the features of Jupyter Notebook and RStudio IDE that make them popular for data science projects.
- Explain how IBM Watson Studio and other IBM data science tools can be used by data scientists.

UNIT – III

Data Science Methodology
- Describe what a methodology is and why data scientists need a methodology.
- Determine an appropriate analytic model including predictive, descriptive, and classification models to analyse a case study.
- Apply the six stages in the Cross-Industry Process for Data Mining (CRISP-DM) methodology to analyze a case study.
- Decide on appropriate sources of data for your data science project.

UNIT – IV

Databases and SQL for Data Science with Python
- Analyze data within a database using SQL and Python.
- Compare and contrast DDL to DML.
- Create a relational database on Cloud and work with tables.
- Write SQL statements including SELECT, INSERT, UPDATE, and DELETE.

REFERENCES:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
4. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.
5. https://www.coursera.org/specializations/introduction-data-science