S. S. JAIN SUBODH P.G. COLLEGE

(AUTOMOMOUS)

DEPARTMENT OF COMPUTER SCIENCE

Syllabus

Three Year Undergraduate Programme

Bachelor of Computer Applications (BCA)

I & II SEMESTER EXAMINATION 2025-26
III & IV SEMESTER EXAMINATION 2026-27
V & VI SEMESTER EXAMINATION 2027-28

AS PER NEP- 2020

Bachelor of Computer Applications (BCA)

Three year (Six Semester) Course

The course of study of Bachelor of Computer Applications (BCA) shall extend over a period of six semesters spread over three years. On satisfactory completion of the course and after passing the examinations, a candidate will be awarded the Bachelor of Computer Applications degree.

Every academic year shall be divided into two semesters. I semester starts from July and ends in December. II semester starts from January and ends in June and so on. There shall be an examination at the end of each semester. The examinations shall consist of theory papers, practical papers.

The examination of each semester will consist of four theory papers, and three practical papers.

Medium of instructions and examination will be **English only**.

Eligibility for admission:

Admission procedure for I semester starts in the month of June/July every year. The admission of the BCA course should be made irrespective of the stream (Arts/Science/Commerce) a candidate must have passed 10+2 level exam of any board with 50% or more (45% for SC/ST/OBC/SOBC category) in aggregate without any approximation.

Examination Scheme:

Each theory paper shall be of 100 marks (70 marks for written examination of 3 hrs. duration and 30 marks for internal assessment).

Each practical paper shall be of 100 marks (60 for practical exam and 40 for internal assessment). The basis for internal evaluation in theory shall be home assignment, internal test and regularities in the attendance.

The basis for internal assessment in the laboratory courses shall be timely submission of the lab. records, performance in the lab, internal tests etc.

Each theory paper examination will be of three-hour duration and shall carry 70 marks. Theory paper shall contain **three parts**.

a) Part A, will contain 12 questions (student will attempt any 10) of very short questions each carrying 1 mark.

b) Part B, will contain 4 short descriptive types of questions (1from each unit) each carrying 5 marks, all are compulsory.

c) Part C, will contain 4 long descriptive types of questions (1from each unit) each carrying 10 marks, all questions are compulsory with internal choice.

Each practical examination (Maximum marks 100) will be of 2-hours duration on one day and carry 60 marks for assigned exercise(s), Practical File and Viva-voce in the examination and 40 marks for the Internal Assessment.

Examination Scheme

Particular	**No. of questions**	**Marks of each question**	**Total Marks**
Part A	12 Very Short Questions (attempt any 10 questions)	10 X 1	**10**
	4 Short Question from each Unit (Compulsory)	4 X 5	**20**
Part B	4 Questions from each Unit with Internal Choice	4 X 10	**40**
Total			**70**

Passing Criteria: Rules and Regulations for promotion of students to higher classes and matters related to examinations

- Promotion from odd semesters to even semesters is automatic, provided the student has registered his / her name for the examination by paying the required examination fee.
- To gain eligibility for promotion to the next year (III / V Sem.), a student is required to pass in at least 50% of the subjects offered in the previous year's semesters put together.
- A student is required to score a minimum of 40% in a subject (theory and internal assessment put together). However, he/she has to score a minimum of 40% in theory. In the case of subjects with practical it is mandatory for the student to score 40% in the practical examination to be declared to have passed in that subject. If the student fails in theory or practical, he/she should reappear for theory or practical examination as the case may be. Examinations will be conducted for odd and even semesters at the end of each semester. There is no provision of Supplementary examinations in Semester Scheme courses.
- If student does not secure minimum marks in theory paper but clears the practical exam of that paper then practical marks will be carried forward.
- Students have to appear in both the internal exams of each semester. There will be no provision of repeat internal examinations under any circumstances.
- Candidate must complete the course within the double of the course duration time after appearing in the main exam. Candidate will be allowed to appear 3 times (1 Main + 2 extra attempts) in that particular paper.
- Candidate taking admission in Autonomous course will not be allowed to simultaneously pursue any other regular course from any other university and they will also not be allowed to do any full time job.

Attendance: A candidate shall be required to put in a minimum of 75% attendance at the lectures and 75% attendance at the practical's separately in each paper.

Examination Scheme

S. No.	Paper	ESE	CIA	Total
1	Theory	70%	30%	100
2	Practical	60%	40%	100

Number of Units in Syllabus

S. No.	Stream	No. of Units
1	BCA	4

Maximum Marks for the Course and Number of Units of Each subject 3 Years / 6 Semesters

S. No.	Stream	Semester	Number of Papers per Semester		Total Marks of I Semester	Sub Total	Grand Total
			Theory	Practical			
1	BCA	I, II, III, IV and V Semester	4 X 100	4 X 100	400 + 300=700	700 X 5=3500	3500
		VI Semester Project	4 X 100	4 X 100	400 + 300=700	700 X 1=700	700
							4200

Award of Division and Grade:

To award Division and Grade to students the total of two internal assessment & End term semester exam marks in all subjects will be considered. Over all merit / rank of student will be declared after compilation of marks / grade secured by the candidate in all the semesters of that course. The distribution is as follows.

% of Marks	Division	Grade
90.01% and above	I	Outstanding
80.01-90.0%	I	A++
70.01-80.0%	I	A+
60.0-70.0%	I	A
54.01-59.99%	II	B
48.01-54%	II	C
40.01-48.0%	Pass	D
Less than 40%	Repeat / Fail	E

Programme Outcome

This course aims to establish a strong academic foundation for individuals pursuing a career in Computer Applications, ranging from moderate to advanced levels. Its primary focus is to provide students with a solid conceptual understanding of computer applications within practical environments.

The program has been meticulously crafted to equip students with the necessary knowledge, skills, and aptitude demanded by the current IT market. Therefore, the curriculum places greater emphasis on programming and software applications. Through this course, students will gain proficiency in utilizing diverse development tools for creating application software, while also developing expertise in automation methodologies.

Programme Outcomes

Upon completion of the three-year BCA program, students will possess the following capabilities:

PSO1: Demonstrate the ability to apply theoretical knowledge to various fields.

PSO2: Develop language proficiency to meet the demands of corporate communication.

PSO3: Prepare students in various technology disciplines, including computer applications, computer networking, software engineering, JAVA, database concepts, and programming.

PSO4: Introduce the concept of project development using the technologies learned during the semester to enhance programming skills in young IT professionals.

PSO5: Improve logical ability and programming concepts through practical implementation in the programming lab.

PSO6: Prepare students for the future by fostering creativity, social awareness, and general knowledge.

PSO7: Encourage students to transform their start-up ideas into reality through implementation.

PSO8: Ability to understand changes and future trends in the field of computer applications.

PSO9: Identify, formulate, analyze, and solve programming problems using different programming languages.

Scheme of Examinations & Syllabus
w. e. f. session 2025-26

BCA-I Semester						
Sem	**Course Code**	**Course Title**	**Course Type**	**Theory/ Practical**	**Teaching Hours/ Week**	**Credits**
I	PBCA101	Programming in C	CC(Major)	Theory	4	4
	PBCA102	Web Application Development	CC(Major)	Theory	4	4
	PBCA103	Computer Fundamentals & Office Management Tools	CC(Major/ Minor)	Theory	4	4
	PBCA151	Programming in C Lab	CC(Major)	Practical	4	2
	PBCA152	Web Application Development Lab	CC(Major)	Practical	4	2
	PBCA153	Office Management Tools Lab	CC(Major/ Minor)	Practical	4	2
		AEC1 (Hindi and English)	AEC	Theory	4	4
		SEC1 (Mathematics for Computing)	SEC	Theory	2	2
		VAC1 (Choice Based)	VAC	Theory	2	2
			Total		**32**	**26**
II	PBCA201	Operating Systems	CC(Major)	Theory	4	4
	PBCA202	Database Management System	CC(Major)	Theory	4	4
	PBCA203	Computer Organization & Architecture	CC(Major)	Theory	6	6
	PBCA251	Operating Systems Lab	CC(Major)	Practical	4	2
	PBCA252	DBMS Lab	CC(Major/ Minor)	Practical	4	2
		AEC2 (Hindi and English)	AEC	Theory	4	4
		SEC2 (Effective Communication Skills)	SEC	Theory	2	2
		VAC2 (Choice Based)	VAC	Theory	2	2
			Total		**32**	**26**

Course Content for BCA Semester I and II 2025-26

Semester: I

Corse Code: **PBCA101**	Course Title: **Programming in C**
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

Upon successful completion of this course, students will be able to learn:

- To Understand the basic language implementation techniques
- Develop ability to learn new languages more quickly
- To understand the concept of functional programming language
- Develop ability to learn and write small programs in different programming Languages

Course Outcomes (COs):

After completing this course satisfactorily, a student will be able to:

- Understand the basic programming concepts and syntax of the C language.
- Design and implement algorithms to solve simple programming problems.
- Read, understand and trace the execution of programs written in C language
- Write the C code for a given problem
- Perform input and output operations using programs in C
- Write programs that perform operations on arrays Course Content
- Write, compile, and execute C programs using integrated development environments (IDEs).

PBCA101: Programming in C

UNIT- I

Basic concepts of Programming languages, Programming Domains, Language Evaluation criteria and language categories, Evolution of major programming languages. Describing syntax and semantics, formal methods of describing syntax, Pseudo code, Design of Algorithm & Flowchart

UNIT-II

Fundamentals of C: History and importance of C, basic structure and execution of C programs, constants, variables, and data types, Various type of declarations, operators types

and expressions, evaluation of expressions, operator precedence and associability. Managing input and output operations, decision making and branching.

Iteration: while, do…while, for loop, nested loops, break & continue, goto statements.

UNIT-III

Array and String: One-dimensional array and their declaration and initialization, two-dimensional arrays and their initializations, character arrays (One and Two dimensional), reading and writing strings, string - handling functions.

Functions: Need and elements for user –defined functions, definition of functions, return values and their types, function calls and declaration, recursion, parameter passing, passing arrays and strings to functions, the scope, visibility and life time of variables.

UNIT-IV

Understanding Pointers: Accessing the address of a variable, declaration and initialization of pointer variables, accessing a variable through its pointer, pointers and arrays, pointers and function arguments, functions returning pointers.

Structures and Unions: Defining structure, declaring structure variable and accessing structure members, initialization of structure, operation on individual members, and array of structures, union, size of structure.

Recommended Books:

1. Balagurusamy E; Programming in ANSI C;FifthEdn; Mc Graw Hill,2011.
2. KanetkarY.; LET US C; X Edition, BPB,2010.
3. Deitel HM & Deitel JP; C How to program; 5thEdn; Pearson Pub
4. GottfriedB; Programming with C: SchaumQutlines; Mc Graw Hill Edition.

Corse Code: **PBCA102**	Course Title: **Web Application Development**
Course Credit **: 04**	Hours/Week**: 04**

Course Objectives (COs):

By the end of this course, students will be able to:

- Comprehend the optimal technologies for addressing web client/server challenges.
- Evaluate and create real-time web applications.
- Utilize JavaScript for dynamic effects and form input validation.
- Analyze and select suitable client-side and server-side application technologies.

Course Outcomes (COs):

On completion of the course, the student will be able to:

- Understand best technologies for solving web client/server problems
- Analyze and design real time web applications
- Use Java script for dynamic effects and to validate form input entry
- Analyze to Use appropriate client-side and Server-side application technology

PBCA102 : Web Application Development

Unit – I

The Internet – Basic of internet, file transfer, telnet, usenet, gopher, wais, Archie and veronica. Introduction to Internet Protocols-, HTTP, FTP, SMTP protocols.

World Wide Web : Elements of the Web, Web browser and its architecture, The web server, the proxy server, Microsoft internet explorer, viewing pages with a browser, using a browser for Mail, News and chat, Security and Privacy issues (cookies, firewalls, Data Security, executable Applets and scripts, blocking system).

Unit – II

HTML Fundamentals: Introduction to HTML, HTML Elements, HTML Semantics, HTML 5 Doc Types, New Structure Tags, Section, Nav, Article, Aside, Header, Footer, HTML Attributes, Headings, Paragraphs, Styles, Quotations, Blocks, Classes, Layout, Iframes, Creating HTML Pages, incorporating Horizontal Rules and Graphical Elements, Hyper-links, Creating HTML Tables, Creating HTML Forms, HTML and Image Techniques, HTML and Page, Development of Website and Webpage (Planning, Navigation and Themes, Elements of a Web page, steps of creating a site, publishing and publicizing site structuring web site.

Unit–III

Cascading Style Sheets: Understanding Style Sheets, CSS Syntax and Applying Style Sheets to HTML document, Developing Style Sheets: inline, internal and external. CSS Selectors, <DIV> tag, Using class and ID, Styling Backgrounds, Styling borders, Styling Text, Styling Fonts, Styling Links, Styling Lists, Styling Tables, Margin, Flex and Grids. **Bootstrap & Web page design** : CMS, Banks of CMS, Joomla/wordpress-Installation, Design and development of websites.

Unit–IV

Java script: Introduction to scripting language, Client Side Scripting, memory concepts, arithmetic decision making. Java script control structures, Java script functions, JS Popup Boxes, events, program modules in java script, function definitions duration of identifiers, scope rules, Controlling Programming Flow, recursion java script global functions. Arrays handling in Java script**,** The Java Script Object Model, Developing Interactive Forms, Validation of Forms, Cookies and Java Script Security Controlling Frames in Java Script, Client – Side Java Script Custom.

References :

1. The Colete eference: HTML & XHTML; ThomasA.Powel, 4th Edn.
2. Mastering HTML 4.0 by DeborahS.Ray an EricJ.Ray From BPB
3. Mastering Java Script, BPB publication.
4. Internet and web technology by Raj Kamal, TMH Publication 2. StevenHolzner,
5. The Complete Reference Java Scripts,, TataMcGraw – Hill,3rd Edn.
6. Java Script, DonGosselin,Vikas publications

Corse Code: **PBCA103**	Course Title: **Computer Fundamentals & Office Management Tools**
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

By the end of this course, students will be able to:

- Understand Fundamental Computing Concepts and gain a solid foundation in the basic principles of computer science, including hardware, software, and networking.
- Develop Proficiency in Office Management Tools such as word processors, spreadsheets, presentation tools, and database management systems.
- Apply Information Technology in Business Contexts to Understand how information technology can be applied to solve business problems and improve organizational efficiency.

Course Outcomes (COs):

- Introduction to computers, classification of computers, anatomy of computer, constituents and architecture, microcontrollers
- Internet basics, features, applications, services, internet service providers, domain name system, browsing, email, searching
- Introduction to Internet basic, e-mail, Web basics
- Office Activities using Word Processor Software
- Office Activities using Spreadsheets Software
- Office Activities using Presentation Software
- Office Activities using Database Software
- Office Activities involving Multimedia Editing (Images, Video, Audio …)
- Operating System Configuration, MS Configuration.

PBCA103: Computer Fundamentals & Office Management Tools

UNIT- I

Introduction to Computers: Characteristics of computers, Evolution of computers, generation of computers, Block diagram of computer & role of each block, classification of computers. Input and Output Devices

Primary and Secondary Memory: Memory hierarchy, Random access memory (RAM), types of RAM, Read only memory (ROM), types of ROM. Classification of secondary storage devices, magnetic tape, magnetic disk, optical disk.

Number Systems: Introduction to number system, Binary, Octal, Hexadecimal, conversion between number bases, Arithmetic operations on binary numbers, Alphanumeric- BCD, EBCDIC, ASCII, Unicode.

UNIT-II

Computer Software: software categories, system software, application software, utility software. Classification of system software, **Computer Languages**: Introduction, classification of programming languages, generations of programming languages, features of a good programming language.

Internet Basics: Introduction,, Features of Internet, Internet applications, Services of Internet, Logical and Physical addresses, Internet Service Providers, Domain Name System.
Web Basics : Introduction to Web, Web browsers, http/https, URL.

UNIT-III

MS Word: Word processing, MS-Word features, creating saving and opening documents in Word, interface, toolbars, ruler, menus, keyboard shortcut, editing, previewing, printing & formatting a document, advance features of MS Word, find & replace, using thesaurus, mail merge, handling graphics, tables, converting a Word document into various formats like-text, rich text format, Word perfect, etc.

MS Excel: Worksheet basics, creating worksheet, entering data into worksheet, data, text, dates, alphanumeric values saving & quitting worksheet, opening and moving around in an existing worksheet, Toolbars and menus, Keyboard shortcuts, working with single and multiple workbook, working with formula & cell referencing, Auto sum, coping formulas, absolute and relative addressing, formatting of worksheet, previewing & printing worksheet, Graphs and Charts, Database, macros, multiple worksheets-concepts.

UNIT-IV

Power Point: Creating and viewing a presentation, managing Slide Shows, navigating through a presentation, using hyperlinks, advanced navigation with action setting and action buttons, organizing formats with MasterSlides, applying and modifying designs, adding graphics, multimedia and special effects.

Microsoft Access: Planning a database (tables, queries, forms, reports), creating and editing database, customizing tables, linking tables, designing and using forms, modifying database structure, Sorting and Indexing database, querying a database and generating reports.

Reference Books:

1. SanjaySaxena; A First Course in Computers 2003 Edition; VikasPub.
2. Computer Fundamentals by P.K.Sinha, BPB Publication.
3. Computer Fundamentals and Programming in C,ReemaThareja,OXFORDUniversity Press.
4. Microsoft; 2007/2010 Microsoft Office System; PHI.
5. Microsoft; Microsoft Office 2007/2010: Plain & Simple; PHI.
6. MS-Office , Dr.S.S.Shrivastava, Published by Laxmi Publication.
7. Office 2019:In Easy Steps,MichalPrice ,BPB Publication.

Corse Code: **PBCA151**	Course Title: **Programming in C Lab**
Course Credit : 02	Hours/Week: 04

Content : **Recommended exercises**

Part A:

1. Program to read radius of a circle and to find area and circumference
2. Program to read three numbers and find the biggest of three
3. Program to demonstrate library functions in math.h
4. Program to check for prime
5. Program to generate n primes
6. Program to read a number, find the sum of the digits, reverse the number and check it for palindrome
7. Program to read numbers from keyboard continuously till the user presses 999 and to find the sum of only positive numbers
8. Program to read percentage of marks and to display appropriate message (Demonstration of else-if ladder)
9. Program to find the roots of quadratic equation (demonstration of switch Case statement)
10. Program to read marks scored by n students and find the average of marks (Demonstration of single dimensional array)
11. Program to remove Duplicate Element in a single dimensional Array
12. Program to perform addition and subtraction of Matrices

Part B:

1. Program to find the length of a string without using built in function
2. Program to demonstrate string functions.
3. Program to demonstrate pointers in C
4. Program to check a number for prime by defining isprime( ) function
5. Program to read, display and to find the trace of a square matrix
6. Program to read, display and add two m x n matrices using functions
7. Program to read, display and multiply two m x n matrices using functions
8. Program to read a string and to find the number of alphabets, digits, vowels, consonants, spaces and special characters.
9. Program to Reverse a String using Pointer
10. Program to Swap Two Numbers using Pointers
11. Program to demonstrate student structure to read & display records of n students.
12. Program to demonstrate the difference between structure & union.

Note: **Student has to execute a minimum of 10 programs in each part to complete the Lab course.**

Corse Code: **BCA152**	Course Title: **Web Application Development Lab**
Course Credit **: 02**	Hours/Week**: 04**

Content : Recommended exercises

HTML:

1. Basics Elements & Attributes, HTML Formatting tags, Links,
2. Images, Tables, Forms Elements
3. HTML5 Audio and Video, HTML5 Input Types & Attributes
4. CSS Syntax, CSS Attribute Selectors
5. CSS properties: Fonts, Background, Colors, Links, Lists,
6. CSS Box Model, Display, Opacity, Float, Clear
7. CSS Layout, CSS Navigation Bar,
8. CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:

1. Displaying Output, DeclaringVariables, Operators, Arithmetic, Data Types, Assignment,
2. JavaScript Functions, Booleans, Comparisons, Conditional ,
3. JavaScript Switch, Loops, Break, Type,
4. JavaScript Objects, Scope,
5. Strings and String Methods
6. Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
7. JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects,
8. JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

Corse Code: **PBCA153**	Course Title: **Office Management Tools Lab**
Course Credit : 02	Hours/Week: 04

Content: Content : Recommended exercises

- Exercises based on Word, Excel, Power Point and Access.

Course Content for BCA Semester II

Semester: II

Corse Code: **PBCA201**	Course Title: **Operating Systems**
Course Credit **: 04**	Hours/Week**: 04**

Course Objectives (COs):

Upon finishing the course, students will be able to:

- To design and understand the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems.
- To evaluate, and compare OS components through instrumentation for performance analysis.
- To analyze the various device and resource management techniques for timesharing and distributed systems
- To develop and analyze simple concurrent programs using transactional memory and message passing, and to understand the trade-offs and implementation decisions

Course Outcomes (COs):

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
- Analyse important algorithms e.g. Process scheduling and memory management algorithms
- Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques
- Demonstrate the ability to perform System Administration tasks in LINUX

PBCA201 : Operating Systems

Unit – I

Concepts: Operation System & its need, functions of OS, Types of OS : Simple Batch Systems, Multiprogrammed Batched Systems, Time-Sharing Systems, Parallel Systems, Distributed Systems and Real-Time Systems.

Operating-System Structures: System Components, Operating System Services, System Calls, System Structure, Virtual Machines, Process Management.

Unit – II

CPU Scheduling Algorithms :Basic Concepts, Scheduling Criteria, FCFS, SJF, Priority, Round-Robin, Multilevel Queue, Multilevel Feedback Queue, Multiple-Processor Scheduling.

Process Synchronization & Deadlocks: The Critical section problem, synchronization hardware semaphores, Classical problems of synchronization, Critical regions, System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Unit-III

Memory Management: Background, Logical versus Physical Address space, Swapping, Contiguous allocation (fragmentation), Paging, Segmentation. Virtual Memory, Demand Paging, Page-replacement Algorithms (FIFO, Optimal, LRU, Counting).

File Management: File Concepts (Operations & Attributes), Access Methods, Directory Structure, File System Structure, Allocation Methods (Contiguous Allocation, Linked Allocation, Indexed Allocation).

Device Management: General device characteristics, device controllers, device drivers, Interrupts Driven I/O, Memory Mapped I/O, Direct Memory.

Unit-IV

Introduction to Linux , Evolution of Linux, Linux Architecture, Linux file system (inode, Super block, Mounting and Unmounting), Essential Linux Commands and Shell Scripts (Internal and External Commands), Kernel, Process Management in Linux.

Recommended reference books:

1. A.Silbersachatz and P.Galvin, “Operating System Concepts”, Addison-Wesley, 5th Ed., 2001.
2. GaryNutt: Operating Systems-A Modern Perspective (Second Edition), Pearson Education, 2000.
3. Tanenbaum A.S., Modern Operating Systems, PHI Publ.
4. PetersonRichard, “ The Complete Reference Linux “ Tata McGraw Hill.
5. SimitabhaDas, “Unix/Linux Concepts & Applications”. Tata McGraw Hill
6. AchyutS.Godbole: Operating Systems, Tata Mc-Graw Hill Publishing Company Limited, 2000.
7. HarveyM.Deitel, Operating Systems, Pearson Education, 2001.

Corse Code: **PBCA202**	Course Title: **Database Management System**
Course Credit : 04	Hours/Week: 04

Course Objectives (COs):

Upon finishing the course, students will be able to:

- Upon finishing the course, students will be able to:
- To study types of MySQL databases (Document oriented, keyValue pairs, Column-oriented and Graph)
- To understand detailed architecture, define objects, load data, query data and performance tune MySQL databases.
- Able to handle large volume of data through queries.

Course Outcomes (COs): On completion of the course, the student will be able to:

- Understand terms related to database design and management
- Assess various database models.
- Evaluate the normality of a logical data model, and correct any anomalies
- Implement relational databases using MySQL.

PBCA202 : Database Management System

UNIT- I

Database System Concepts & Architecture: Overview of DBMS, Basic DBMS terminology, data base system v/s file system, Advantages and dis-advantages of DBMS, Coded rules, data independence. Architecture of a DBMS, Schemas, Instances, Database Languages, Database Administrator, Data Models.

UNIT-II

Data Modeling: Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation.

Relational Model : Concepts, Constraints, Languages, Relational database design by ER & EER mapping, Relational algebra relational calculus. Relational Algebra, Fundamental operations of Relational Algebra.

UNIT –III

Database Design: Functional dependencies, loss less decomposition, Normalization : 1-NF, 2-NF,3-NF and BCNF. **Transaction Management :** Transactions: Concepts, ACID Properties, States Of Transaction, Serializaibility, Isolation, Checkpoints, Deadlock Handling.

Recovery System & Security : Failure Classifications, Recovery & Atomicity, Log Base Recovery, Recovery with Concurrent Transactions, Introduction to Security & Authorization.

UNIT-IV

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection, Minus in SQL.

Recommended Books:

1. KorthHF and SilberschatazA, System Concepts, Sixth Edition; McGraw Hill,2010
2. Leon, and Leon, SQL Tata McGraw Hill Pub. Co. Ltd.
3. IvanBayross; SQL/PL 4thEdn: BPB,2009
4. NavatheS.B.ElmasriR,; Fundamentals of Database Systems, Fifth Edition, Pearson 2011.
5. Ramakrishan and Gharke, Database Management Systems, 3rdEd, Tata McGraw Hill, 2007.
6. Singh S.K.; Database Systems; I Edition; Pearson, 2006.

Corse Code: **PBCA203**	Course Title: **Computer Organization & Architecture**
Course Credit : 06	Hours/Week: 06

Course Objectives (COs):

Upon finishing the course, students will be able to:

- The students will be able to understand digital logic design, including logic elements, and their use in combinational and sequential logic circuit design, the basic architecture of processing, memory and I/O organization in a computer system.
- Understand the design of Sequential and Arithmetic Circuits.
- Understand the functions of CPU and I/O devices.
- Understand the operations and structure of Memory.

Course Outcomes (COs): On completion of the course, the student will be able to:

- Understand Boolean Algebra and Data Representation.
- Understand and Design of Sequential and Arithmetic Circuits.
- Boolean Algebra and Data Representation.
- Understand Microprocessor operations.
- Remember and Understand the basics of computer architecture, organization and Design.
- Understand the operations of CPU and I/O devices.
- Understand the operations and organization of Memory.
- Understand the concept of parallel processing and pipelining

PBCA203 : Computer Organization & Architecture

UNIT- I

Boolean Algebra and Logic Gates: Logic Gates, Basic laws of Boolean algebra, Simplification of Boolean algebra.

Combinatorial Logic : Multiplexers, Decoders, Encoders, Adder & Subtracters, Parallel Binary Adder, Parallel binary Subtractor .

UNIT-II

Sequential Logic: Sequential circuits: Flip-flops, S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop.

Register Transfer and Micro Operations: Register Transfer Language, Register transfer, Bus and Memory transfer, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

UNIT-III

Basic Computer Organization and Design: Instruction Codes, Computer Registers; Common bus system; Computer Instructions; Instruction formats; Instruction Cycle; Fetch and Decode, Flowchart for Instruction cycle; Register reference instructions, Addressing Modes.

CPU Design: Specifying a CPU, design and implementation of a simple CPU (fetching instructions from memory, decoding and executing instructions, establishing required data paths).

UNIT-IV

Input-Output Organization : Input-output Interfaces, Asynchronous Data Transfer, Mode of Transfer - Programmed I/O, Interrupt I/O, Direct Memory access(DMA).

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. I/O Interrupt, types of Interrupts, Priority Interrupts, Direct Memory Access(DMA).

Recommended Books

1. M, MorrisMano; Computer System Architectures; III Edition, Prentice Hall of India,2008
2. AndrewS.Tanenbaum , Structured Computer Organization,Printice Hall
3. WilliamStallings, Computer Organization and Architecture , Sixth Edition, Pearson
4. JohnD.Carpinelli: Computer Systems Organization & Architecture; 3rd Edition; Person Education Asia,2008
5. MalvinoB ; Digital Computer Electronics III Edition; TMHL.

Corse Code: **PBCA251**	Course Title: **Operating Systems Lab**
Course Credit **: 02**	Hours/Week**: 04**

Course Outcomes (COs):

- Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
- Analyse important algorithms e.g. Process scheduling and memory management algorithms
- Categorize the operating system's resource management techniques, dead lock management techniques, memory management techniques
- Demonstrate the ability to perform System Administration tasks in LINUX

Content : Recommended exercises

1. Settings and configurations of Linux.
2. To learn directory navigation in Linux-like systems.
3. To practice Linux commands.
4. Practice pattern matching commands.
5. Practice file editing with vi/nano.
6. Shell script to demonstrate application programs.

Corse Code: **BCA252**	Course Title: **DBMS Lab**
Course Credit : 02	Hours/Week: 04

Course Contents : **Recommended exercises**

1. Analyze the organization and identify the entities, attributes and relationships in it.
2. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any.
3. Relate the entities appropriately. Apply cardinalities for each relationship. Identify strong entities and weak entities (if any).
4. Represent all the entities (Strong, Weak) in tabular fashion. Represent relationships in a tabular fashion.
5. Apply the First, Second and Third Normalization levels on the database designed for the organization
6. Practicing DDL commands.
7. Creating databases, how to create tables, altering the database, dropping tables and databases if not required. Try truncate, rename commands etc.
8. Practicing DML commands on the Database created for the example organization
9. DML commands are used to for managing data within schema objects. Some examples: SELECT, INSERT, UPDATE, DELETE
10. Practice queries (along with sub queries) involving ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.
11. Practice queries using Aggregate functions (COUNT, SUM, AVG, and MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.