ST. ALOYSIUS COLLEGE(AUTONOMOUS), JABALPUR

Reaccredited 'A++'Grade by NAAC(CGPA:3.58/4.00)
College with Potential for Excellence by UGC
DST-FIST Supported & STAR College Scheme by DBT

Bachelor of Arts

Scheme 2025-2026

Semester	Paper Type	Paper Name	Theory (70)	Practical (30)
I	Major	DBMS	4	2
	Minor	Python Programming	4	2
II	Major	Office Automation	4	2
	Major	Object Oriented Programming using C++	4	2
	Minor	Operating System	4	2
OLD NEP SCHEME			**Theory(60)**	**Practical(40)**
III	Major/Minor/Elective	Database Management System	4	2
IV	Major/Minor/Elective	Introduction to ASP.NET& C#	4	2
V	Core	Operating System	4	2
	DSE	Programming using Java	4	2
VI	Core	Computer Networks	6	
	DSE	Multimedia Tools and Applications	4	2
	DSE	Internet and its Applications	4	2

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BA I Semester **Paper-Major**

Database Management System

Content of the Course

Theory

Maximum Marks: 70

Units	Topics	No. of Lectures
I	Indian Knowledge System (IKS) in DBMS, Traditional Indian methods of knowledge storage and their relevance to modern databases. Ancient Indian texts, temple records, and manuscripts, Concepts like data organization, indexing, and retrieval in Vedic literature. DBMS applications in IKS include digitization of manuscripts, Sanskrit computational linguistics, and digital preservation initiatives like the National Mission for Manuscripts.	10
II	Definition of database and DBMS, characteristics and advantages, comparison between file system and database, database users and administrator roles, applications of databases, introduction to different data models including hierarchical, network, relational, and object-oriented models. Overview of DBMS architectures such as one-tier, two-tier, and three-tier models, data abstraction and data independence, conceptual, logical, and physical data models.	10
III	Introduction to the relational model, relational schema and tuples, concept of keys including primary key, foreign key, candidate key, and super key, integrity constraints such as domain, entity, referential, and key constraints. Overview of relational algebra and its operations for data manipulation. Introduction to SQL, importance of SQL in databases, SQL data types and constraints, SQL commands. Creating and managing tables in SQL, performing basic SQL queries such as SELECT, INSERT, UPDATE, DELETE, and understanding joins including INNER JOIN, OUTER JOIN, LEFT JOIN, and RIGHT JOIN.	10
IV	Database Design, Normalization and Indexing, Denormalization and its impact on performance, database design process, and schema refinement. Database security concepts, security threats and their solutions, authentication and authorization mechanisms, role of database administrators (DBA), indexing techniques for query optimization, single-level and multi-level indexing, clustered and non-clustered indexing.	15
V	Transactions, Concurrency Control, and Recovery Mechanisms Concept of transactions and ACID properties, need for concurrency control, problems of concurrent transactions, lock-based concurrency control, timestamp-based concurrency control, and deadlocks in databases with prevention techniques. Overview of database recovery, recovery techniques such as log-based recovery. checkpointing, shadow paging, and ARIES recovery algorithm. Implementation of transaction management in SQL with COMMIT and ROLLBACK operations.	15

References

Text Books:

- Database System Concepts–Abraham Silberschatz, Henry Korth, S.Sudarshan(McGraw Hill).
- Fundamentals of Database Systems–Ramez Elmasri, Shamkant B.Navathe (Pearson).

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BA I Semester **Paper-Minor**

Python Programming

Maximum Marks: 70

Units	Topics	No. of Lectures
I	**Introduction to Python and Basics** History and evolution of Python, features and applications, installation and setup of Python environment (IDLE, Anaconda, Jupyter Notebook, VS Code), Python syntax and indentation, variables and data types (numbers, strings, lists, tuples, sets, dictionaries), type conversion, input and output functions, comments and documentation strings, basic operators (arithmetic, relational, logical, assignment, bitwise).	15
II	**Control Structures and Functions** Conditional statements (if, if-else, elif), looping structures (for loop, while loop, nested loops), break, continue, and pass statements, defining and calling functions, function arguments (positional, keyword, default, variable-length), return statement, scope of variables (global and local scope).	15
III	**Data Structure** Lists: creating, indexing, slicing, adding, removing, updating elements, list comprehension; Tuples: definition, accessing elements, immutable nature; Dictionary: key-value pairs, adding, updating, deleting elements. String handling: slicing, concatenation, string functions.	15
IV	**Data Handling using Pandas** Introduction to Python libraries- Data structures in Pandas - Series and Data Frames. Series: Creation of Series from – ndarray, dictionary, scalar value; mathematical operations; Head and Tail functions; Selection, Indexing and Slicing. Data Frames: creation - from dictionary of Series, list of dictionaries, Text/CSV files; display; iteration; Operations on rows and columns: add, select, delete, rename; Head and Tail functions; Indexing using Labels, Boolean Indexing; Importing/Exporting Data between CSV files and Data Frames:	15
V	**Data Visualization** Purpose of plotting; drawing and saving following types of plots using Matplotlib – line plot, bar graph, histogram , pie chart , Scatter Graph , box plot. Customizing plots: adding label, title, and legend in plots.	10

Suggested Reference Books:

1. Python Crash Course – Eric Matthes (No Starch Press).
2. Learning Python – Mark Lutz (O'Reilly).
3. Python Programming: An Introduction to Computer Science – John Zelle.
4. Fluent Python – Luciano Ramalho (O'Reilly).).

Suggestive Digital Platform Weblinks:

- https://www.python.org/doc/ – Official Python Documentation.

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BA II Semester
Major Paper I-
Office Automation
Maximum Marks-70

PARTA: Introduction				
Program: Certificate		**Class:** UG	Year:1Year	Session:2025-26
Subject: Computer Application				
1	Course Code	**C2**		
2	Course Title	**Office Automation (Paper-I)**		
3	Course Type (Core Course/Elective/Generic Elective/ Vocational	**Core Course**		
4	Pre-Requisite(if any)	At least Intermediate in Any course/ stream		
5	Course Learning Outcomes(CLO)	**On the completion of this course, students will be able to:** • Gain hands-on skills in MS Windows, MS Word, MS Excel, MS Access, and MS PowerPoint. • Automate routine office tasks using spreadsheets and macros. • Design well-structured documents with advanced formatting techniques. • Develop professional presentations with animations and transitions. • Integrate traditional Indian knowledge systems into office automation workflows.		
6	Credit Value	**Theory-4Credits**		
7	Total Marks	**Max.Marks:30+70**	**Min. Passing Marks: 35**	
PART B: Content of the Course				
No. of Lectures (in hours per week):2 Hrs. per week				
Total No. Of Lectures: 60 Hrs.				
Module	**Topics**			**No. of Lectures**

I	**Indian Knowledge System (IKS) and its Relevance to MS Office** Ancient Indian knowledge traditions in documentation, record- keeping, and manuscript writing; Evolution of structured writing systems from palm leaf manuscripts to modern digital documentation; Role of Vedic and post-Vedic literature in structured data storage and information retrieval; Traditional methods of calculation and tabulation in ancient India and their relevance to modern spreadsheet applications; Ethical aspects of Indian knowledge systems and their application in professional documentation and communication; Indian logic systems (*Nyaya, Mimansa*) and their structured approach to problem-solving in database and spreadsheet management; Use of Sanskrit grammatical rules as an analogy to modern data structuring principles; Lessons from ancient Indian education systems (Nalanda, Takshashila) on effective presentation and communication skills; Adaptation of Indian knowledge preservation techniques in modern document management using MS Office tools.	10

	Keywords: Indian Knowledge System, Vedic Literature, Ancient Documentation, Palm Leaf Manuscripts, Data Structuring, Ethical Documentation, Computational Logic, Nalanda, Takshashila, Traditional Tabulation. **Activity:** • Research and present **ancient Indian documentation methods** (e.g., palm leaf manuscripts). • Create a **digital document** in MS Word that simulates ancient record-keeping methods. • Use **Excel** to perform traditional tabulation techniques inspired by Indian mathematics. • Apply **ethical documentation practices** inspired by Dharma principles in MS Office reports. • Develop a **PowerPoint presentation** on ancient Indian education systems (Nalanda, Takshashila) and their relevance to modern communication skills.	
II	**MS Windows** Introduction to MS Windows; Features of Windows; Various versions of Windows & their use; Working with Windows; My Computer & Recycle Bin; Desktop, Icons, and Windows Explorer; Screen description & working styles of Windows; Dialog Boxes & Toolbars; Working with Files & Folders; Shortcuts & Autostarts; Accessories and Windows Settings using Control Panel; Start button & Program lists; Installing new Hardware & Software. **Keywords:** Windows Versions, Control Panel, Explorer, Shortcuts, File Management, Hardware, Software Installation. **Activity:** • Identify and compare **different versions of Windows** and their features. • Practice using **Windows Explorer** for file and folder management. • Customize **Windows settings** using the Control Panel. • Demonstrate the process of **installing new hardware and software**. • Create and manage **shortcuts and autostart programs**.	10

III	**Basics of MS Word** Creating Word documents; The Word Window, Entering Texts, Editing Document texts; Selecting Texts, Copying and Moving Texts; Applying Text Enhancements; Applying Fonts and Font Styles in Word, Highlighting Text for a Distinctive Look. Aligning and Formatting; Aligning Text using identification options, Setting Line Spacing Options using Tabs. Creating Lists, Numbers, and Symbols; Numbering and Bullets, Creating Special Characters. Replacing and checking Text; Creating and Applying Frequently used Texts, Finding and Replacing Texts, More about Spelling and Grammar using the Thesaurus Command. Getting Print using Print Preview, Changing Page Orientation and Paper Size, Aligning Text Vertically, Setting Margins, Printing Options. **Advanced Formatting Techniques in Word:** Formatting Pages; Formatting Sections, Creating and Modifying Page Numbers, Creating Headers and Footers, Taking Care of Loose Ends, Working With Columns; Working With Newspaper Columns, Revising Column Structure. Constructing High-Quality Tables; Creating and Revising Tables, Modifying Table Structure, Formatting Table, Creating Outlines in Word using Templates, Use of Mail Merge in Microsoft Word. **Keywords:** Word Processing, Text Formatting, Tables, Headers, Footers, Columns, Mail Merge, Printing. **Activity:** • Create and format a **document** with different fonts, styles, and alignments. • Use **bullets, numbering, and special characters** to enhance a document. • Perform **spell check, find, and replace** operations. • Design a **table** and modify its structure and formatting. • Practice **mail merge** to generate personalized letters. • Print the document using **Print Preview** and adjust page settings.	10

IV	**MS Access** Concepts & terms: database tables, relational database, records, fields, controls & objects, queries, forms, reports properties, wizards, macros, MS Access requirements, starting & quitting MS Access, MS Access workspace, tool & views. Creating database & tables with & without wizard, field name, data types & properties, adding & deleting fields, renaming fields & their caption, resizing fields, freezing columns, primary key field & indexing fields. **MS Access Form:** Form wizard, Saving & Modifying forms, Entering & Editing data, Finding, sorting & displaying data, creating queries, using select queries and wildcards. **MS Reports:** Creating reports, Previewing reports, Printing reports, modifying & Saving reports. **Relational databases:** definition, purpose, creation, viewing, deleting. Expressions, Create PivotTable or PivotChart views in an Access desktop database. **Keywords:** Database, Tables, Queries, Forms, Reports, Primary Key, Indexing, PivotTables, Macros. **Activity:** • Create a **database with multiple tables** and set relationships. • Use **form wizard** to create and modify forms. • Perform **query operations** using select queries and wildcards. • Generate and customize **reports** with different properties. • Create and analyze **PivotTables or PivotCharts** in Access. • Practice using **macros** to automate repetitive tasks.	10

V	**Creating Excel Worksheets** Entering and Editing Cell Entries: Excel Application Window, Workbooks and Worksheets, Moving the Cell Pointer, Entering Text and Numbers, Revising Text and Numbers. **Working with Numbers:** Creating Formulae, Formatting numbers. Changing Worksheet Layout; Adjusting Column Width and Row Height, Inserting and Deleting Rows and Columns, Inserting and Deleting Cells, Moving and Copying Cell Contents, Naming Worksheets, Selecting Worksheets, Copying and Moving Worksheets, Inserting and Deleting Worksheets. **Other Formatting Options:** Aligning Text, Border and Color. **Printing in Excel:** Print Preview, Changing Page Setup, Checking Worksheet Spelling. **Advanced Techniques in Excel:** Using Functions and References; Use of Functions, Entering Functions, Relative and Absolute Cell References. Creating Named Ranges, Creating Easy-to-Understand Charts; Pie Charts, Series Charts, Creating Charts, Moving, Sizing and Printing Chart Objects. **Editing and Formatting Charts:** Adding a Data Series, Deleting a Data Series, Modifying and Formatting Charts. **Macros:** Creation of Pivot Table to analyze worksheet data. **Keywords:** Worksheets, Formatting, Formulas, Functions, Charts, PivotTables, Macros, Data Analysis. **Activity:** • Create an **Excel worksheet** with multiple sheets and apply formatting. • Use **formulas and functions** for data calculation. • Generate and customize **charts** (Pie, Series) using Excel data. • Create and analyze **PivotTables** for data summarization. • Develop a **macro** to automate a repetitive task. • Use **print preview** and modify page setup for better print output.	10
VI	**Creating PowerPoint Presentations** Creating a Basic Presentation, Building Presentations, Modifying Visual Elements, Formatting and Checking Text, Adding Objects, Applying Transitions, Animation Effects and Linking, Preparing Handouts. **Keywords:** Presentations, Slides, Animations, Transitions, Handouts, Formatting, Multimedia. **Activity:** • Create a **basic PowerPoint presentation** with multiple slides. • Apply **transitions and animation effects** to enhance visual appeal. • Add and format **text, images, and multimedia objects.**	10

	• Prepare **handouts** for presentation distribution. • Use **slide linking** for navigation between different sections. • Check and improve **text formatting and consistency.**	

PART C:Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. Microsoft Office 97: Will Train, Gini Courter, Annette Marquis (BPB Publication).
2. Microsoft Office 2000: Gini Courter & Annette Marquis (BPB Publication).
3. MS Office 2000 for Everyone: Saxena Sanjay, sschnd.
4. Writer's Guide to Microsoft Word: Kari Holloway.
5. Access 2016 Bible: Michael Alexander, Richard Kusleika.
6. Excel 2019: Greg Harvey / Microsoft PowerPoint Made Easy: Chris Smith.

Suggestive Digital Platform Web Links:

1. https://www.webucator.com/how-to/how-use-mail-merge-microsoft-word.cfm – How to Use Mail Merge in Microsoft Word.
2. https://support.microsoft.com/en-us/office/create-pivottable-or-pivotchart-views-in-an-access-desktop-database-83e524df-dfbd-456d-9dd0-0a48claa6752 – Create PivotTable or PivotChart Views in an Access Database.
3. https://support.microsoft.com/en-us/office/create-a-pivottable-to-analyze-worksheet-data-a9a84538-bfe9-40a9-a8e9-f99134456576 – Create a PivotTable to Analyze Worksheet Data.
4. https://www.youtube.com/watch?v=Zv3XI/IBb3V6A – YouTube Tutorial on MS Office.
5. http://www.digimat.in/nptel/courses/video/l21106007/L12.html – NPTEL MS Office Course Video.

Suggested equivalent online courses

https://nptel.ac.in/courses/106/105/106105163/

PART D:Assessment and Evaluation

Maximum Marks:	100
Continued Comprehensive Evaluation(CCE):	30
University Exam(UE):	70
Time:03:00Hours	

Internal Assessment: Continued Comprehensive Evaluation(CCE):	Class Tests/Presentation/Assignment	30 Marks
External Assessment: University Exam	Section(A):Very Short Questions Section (B) : Short Questions Section(C): Long Questions	70 Marks

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BA II Semester
Major Paper-II
Object Oriented Programming using C++

PART A: Introduction			
Program: Certificate	Class: UG	Year: 1 Year	Session: 2025-26
Subject: Computer Application			

1	Course Code	C3
2	Course Title	Object Oriented Programming using C++
3	Course Type (Core Course/Elective/Generic Elective/ Vocational	Core Course
4	Pre-Requisite (if any)	To study this course, a student must have had the class.
5	Course Learning Outcomes(CLO)	On completion of this course, learners will be able to: • Learn the principles of object-oriented programming and apply them in C++. • Develop structured, reusable, and modular applications. • Implement file handling, exception handling, and STL. • Design optimized and scalable applications using C++. • Integrate structured problem-solving techniques with traditional Indian logic.
6	Credit Value	Theory-4 Credits
7	Total Marks	Max. Marks: 30+70 / Min. Passing Marks: 35

PART B: Content of the Course

No. of Lectures (in hours per week): 2 Hrs. per week

Total No. of Lectures: 60 Hrs.

Module	Topics	No. of Lectures
I	Indian Knowledge System (IKS) and Programming Concepts Ancient Indian contributions to mathematics and logic (Aryabhata, Brahmagupta) and their relevance to computational models. Concepts of structured problem-solving in Indian logic (Nyaya, Mimansa) and their influence on algorithmic thinking. Traditional knowledge classification systems and their parallels in moderndatabasesandfilestructures. Application of IKS in Object- Oriented Programming: • Data Structures & Algorithms: Influence of Indian mathematics on recursion and sorting techniques. • Logical Reasoning in Programming: Vedic methods for structured reasoning applied in decision-making constructs. • Code Efficiency & Optimization: Ancient computational efficiency principles and their application in modern programmingpractices. Keywords: Indian Knowledge System, Vedic Mathematics, Ancient Algorithms, Computational	10

	Thinking,LogicSystems. Activities: • Research ancient Indian algorithmic techniques and implement a sorting algorithm using them. • CreateaprogramsimulatingVediccomputational methods. • Develop a project showcasing logic systems inspired by Nyaya or Mimansa. • Apply traditional data classification concepts to a small database project.	
II	Introduction to Object-Oriented Programming & C++ Basics Introduction to programming paradigms: Procedural vs. Object-Oriented Programming; Features and benefits of Object- Oriented Programming (OOP). Basics of C++ programming: Syntax, data types, variables, constants, operators, expressions, input/output handling using cin and cout. Control structures: Decision-making statements (if, if-else, switch), looping constructs (for, while, do-while). Functions in C++: Function declaration, definition, function overloading, inline functions, recursion. Keywords: OOP, Procedural vs. Object-Oriented, C++ Syntax, Variables, Operators, Loops, Functions. Activities: • Write a C++ program using basic syntax, cin, and cout. • Demonstrate looping constructs with nested loops. • Create a recursive function to calculate factorial or Fibonacci series. • Implement a simple C++ program with function overloading.	10
III	Classes, Objects, and Memory Management Concept of a class and object: Defining a class, creating objects, accessing class members. Constructors and destructors: Types and uses, this pointer. Static data members and static member functions: Friend functions and friend classes. Dynamic memory allocation: Using new and delete. Other concepts: Array of objects, object as function arguments, returning objects from functions. Keywords: Classes, Objects, Constructors, Destructors, Static	10
	Members, Friend Functions, Dynamic Memory. Activities: • Create a C++ program with multiple classes and objects. • Implement constructor overloading in a C++ project. • Use dynamic memory allocation to create and manage an array	

	of objects. • Write a program demonstrating friend functions and static members.	
IV	Inheritance, Polymorphism, and Operator Overloading Concept o inheritance: Types of inheritance: single, multiple, multilevel hierarchical, hybrid, visibility modes in inheritance, functior overriding, virtual base class. Polymorphism: • Compile-timepolymorphism:Functionoverloading, operator overloading. • Runtime polymorphism: Virtual functions, pure virtual functions, abstract classes. Operatoroverloading:Rulesforoperatoroverloading, overloading unary and binary operators, type conversion. Keywords:Inheritance,Polymorphism,VirtualFunctions, Function Overloading, Operator Overloading. Activities: • Implement single and multiple inheritance in a C++ program. • Create an application demonstrating function overloading and overriding. • Use operator overloading for arithmetic operations on custom objects. • Develop a polymorphic base class with derived classes implementing different functionalities.	10
V	File Handling and Advanced C++ Features File stream classes in C++: Reading/writing files, file modes, file pointers, error handling in file operations. Templates: • Function templates and class templates • Advantages of generic programming Exception handling: Using try, catch, throw, and handling multiple exceptions. Standard Template Library (STL): • Containers: vector, list, map, set • Iterators • Algorithms Keywords: File Handling, Templates, Exception Handling, STL, Containers, Iterators. Activities: • Write a program to read and write data to a file. • Create a template-based sorting function. • Demonstrate exception handling with multiple catch blocks.	10
	• Use STL containers and iterators to build a small data structure.	

VI	Applications of C++ and Industry Practices Real-world applications of C++: System programming, game development, financial applications, embedded systems. Introduction to GUI programming with C++: Basics of Qt. Debugging techniques: Profiling tools and code optimization methods. Capstone project: Building an application using OOP concepts. Keywords: C++ Applications, GUI, Debugging, Optimization, Capstone Project. Activities: • Create a mini C++ project with GUI using Qt framework. • Demonstrate code optimization techniques in a C++ program. • Use debugging tools to identify and fix errors in a C++ project. • Design a financial calculator or inventory management system.	10

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

1. The C++ Programming Language – Bjarne Stroustrup (Addison-Wesley).
2. C++ Primer – Stanley B. Lippman, Josée Lajoie, Barbara E. Moo (Pearson).
3. Effective C++ – Scott Meyers (O'Reilly).
4. Accelerated C++ – Andrew Koenig, Barbara E. Moo (Addison-Wesley).
5. Programming: Principles and Practice Using C++ – Bjarne Stroustrup.
6. Object-Oriented Programming in C++ – Robert Lafore.

Suggestive digital platform web links:

1. https://cplusplus.com/doc/tutorial/ – C++ Documentation and Tutorials.
2. https:// – Learn C++ with hands-on examples.
3. https:// – C++ Programming from basics to advanced concepts.
4. https:// – C++ problem-solving and implementation.
5. https://nptel.ac.in/courses/106/105/106105151 – NPTEL Online Course on Programming in C++.

Suggested equivalent online courses

https://nptel.ac.in/courses/106/105/106105163/

PART D: Assessment and Evaluation

Maximum Marks :100
Continued Comprehensive Evaluation (CCE):30
University Exam(UE):70
Time:03:00 Hours

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BA II Semester

Minor Paper- Operating System

PART A: Introduction				
Program: Certificate		Class: UG	Year:1Year	Session:2025-26
Subject: Computer Application				
1	Course Code	M2		
2	Course Title	Operating System(Theory)		
3	Course Type (Core Course/Elective/Generic Elective/ Vocational	Core Course		
4	Pre-Requisite(if any)	To study this course, a student must have had the class.		
5	Course Learning Outcomes(CLO)	**On completion of this course, learners will be able to:** • Understand the fundamental concepts, structure, and functions of operating systems. • Learn process management, memory management, file system organization, and device management. • Gain practical experience with system calls, process scheduling, and resource allocation. • Explore security mechanisms, system protection, and synchronization techniques. • Study emerging trends in operating systems, including cloud OS and real-time OS. • Understand traditional Indian computational logic and knowledge systems related to problem-solving.		
6	Credit Value	Theory-4Credits		
7	Total Marks	Max. Marks: 30+70	Min. Passing Marks:35	
PART B: Content of the Course				
No. of Lectures(in hours per week):2Hrs.perweek				
TotalNo.ofLectures:60 Hrs.				
Module	Topics			No. of Lectures

I	**Indian Knowledge System (IKS) and Computational Logic in OS** Traditional Indian contributions to problem-solving techniques, computational models, and logic systems (*Nyaya*, *Mimansa*); Ancient methods of resource allocation and scheduling; Parallels between Indian mathematical algorithms and modern scheduling techniques; Application of structured Indian problem-solving methods in modern computing environments. **Keywords:** IKS, Computational Logic, Nyaya, Resource Allocation, Scheduling, Problem-Solving. **Activity:** • Research and present **Indian logic systems** (*Nyaya*, *Mimansa*) and their problem-solving approaches. • Identify **ancient resource allocation methods** and compare them with modern OS scheduling.	08
	• Demonstrate **Indian mathematical algorithms** applied to scheduling techniques. • Create a **flowchart or diagram** showing the parallels between **ancient and modern scheduling** methods. • Apply **Indian computational logic** principles to develop an algorithm for resource management.	
II	**Introduction to Operating Systems & System Structures** Definition, history, and evolution of operating systems; Types of operating systems: Batch, Time-sharing, Distributed, Real-time, Multiprocessor, Mobile OS; OS components: Kernel, Shell, System Calls, User Interface; OS architecture: Monolithic, Layered, Microkernel; Services provided by OS; Booting process. **Keywords:** Operating System, Kernel, Shell, System Calls, OS Architecture, Booting Process. **Activity:** • Research and present **different types of operating systems** with examples. • Identify and explain **OS components** (Kernel, Shell, System Calls). • Demonstrate the **booting process** in Windows or Linux. • Compare **Monolithic, Layered, and Microkernel** architectures. • Use **command-line interface (CLI)** to execute basic OS commands.	08

III	**Process Management & CPU Scheduling** Concept of process, process control block (PCB), process states, process operations; Threads and multithreading; Process scheduling algorithms: FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling; Context switching; Inter-process communication (IPC); Process synchronization: Semaphores, Mutex, Deadlocks, Deadlock prevention and recovery. **Keywords:** Process, PCB, Threads, Scheduling, Synchronization, Semaphores, Deadlocks. **Activity:** • Explain the **process life cycle** with a diagram. • Create a **flowchart** showing the working of different **scheduling algorithms**. • Demonstrate **multithreading** using a programming language (e.g., Java or Python). • Simulate **context switching** between multiple processes. • Implement **IPC techniques** using pipes or shared memory. • Research and present **deadlock prevention and recovery** techniques.	10 10
IV	**Memory Management & Virtual Memory** Memory hierarchy, contiguous memory allocation, paging, segmentation; Virtual memory concepts, demand paging, page replacement algorithms: FIFO, LRU, Optimal; Thrashing; Memory allocation techniques: Buddy System, Slab Allocator. **Keywords:** Memory Management, Paging, Segmentation, Virtual Memory, Page Replacement, Thrashing. **Activity:** • Create a **diagram** illustrating the **memory hierarchy**. • Simulate **paging and segmentation** using a programming language. • Compare and explain **page replacement algorithms** (FIFO, LRU, Optimal) with examples. • Demonstrate **virtual memory concepts** using OS simulations or virtual machines. • Research and present the **Buddy System and Slab Allocator** techniques. • Identify and explain **thrashing** causes and solutions.	10

V	**File Systems & I/O Management** File system structure, file attributes, file access methods, file allocation strategies (contiguous, linked, indexed); Directory structure, file system mounting, file system interface; Disk scheduling algorithms: FCFS, SSTF, SCAN, C-SCAN; RAID levels and storage management. **Keywords:** File System, Allocation, Directory, Disk Scheduling, RAID, Storage. **Activity:** • Create a **diagram** showing the **file system structure** and directory hierarchy. • Demonstrate **file allocation strategies** with practical examples. • Simulate **disk scheduling algorithms** (FCFS, SSTF, SCAN, C-SCAN) using a program. • Research and explain **RAID levels** and their applications. • Compare **contiguous, linked, and indexed allocation** methods with examples. • Mount and unmount a **file system** on Linux or Windows.	12 10
VI	**Security, Protection, and Emerging Trends in Operating Systems** OS security concepts, authentication, access control, threats and vulnerabilities, intrusion detection; Cryptographic techniques, security policies; System protection mechanisms; Introduction to cloud operating systems, mobile OS, and real-time operating systems. **Keywords:** Security, Protection, Access Control, Cryptography, Cloud OS, Mobile OS, Real-Time OS. **Activity:** • Research and present **OS security concepts** with real-world examples. • Demonstrate **user authentication and access control** techniques. • Simulate **cryptographic techniques** using basic encryption programs. • Identify and explain **threats and vulnerabilities** in modern OS. • Compare **cloud, mobile, and real-time OS** with their features. • Create a **report on intrusion detection** techniques and tools.	12
PART C:Learning Resources		
Textbooks, Reference Books, Other Resources		

Suggested Readings:

1. Operating System Concepts – Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (Wiley).
2. Modern Operating Systems – Andrew S. Tanenbaum (Pearson).
3. Operating Systems: Internals and Design Principles – William Stallings (Pearson).
4. Operating Systems: A Concept-Based Approach – D. M. Dhamdhere (McGraw-Hill).
5. Linux Kernel Development – Robert Love (Addison-Wesley).
6. Designing Data-Intensive Applications – Martin Kleppmann (O'Reilly).

Suggestive Digital Platform Web Links:

- https://www.tutorialspoint.com/operating_system/index.htm – Comprehensive OS tutorials.
- https://www.javatpoint.com/operating-system-tutorial – OS basics, process management, and memory management.
- https://www.geeksforgeeks.org/operating-systems/ – Detailed OS concepts with problem-solving exercises.
- https://www.w3schools.in/operating-system-tutorial – OS theory with practical examples.
- https://nptel.ac.in/courses/106/102/106102132 – NPTEL online course on Operating Systems.

Suggested equivalent online courses
https://nptel.ac.in/courses/106/105/106105163/

PART D:Assessment and Evaluation	
Maximum Marks:	100
Continued Comprehensive Evaluation(CCE):	30
University Exam(UE):	70
Time:03:00Hours	

Internal Assessment: Continued Comprehensive Evaluation (CCE):	Class Tests/Presentation/Assignment	30 Marks
External Assessment: University Exam	Section(A):Very Short Questions Section (B) : Short Questions Section(C):Long Questions	70 Marks

Any remarks/suggestions: Learning's in the course should be emphasized more on practical aspects and real world problems and their solutions.

PART A:Introduction
02:00

Program: Certificate	**Class:** UG	**Year:1Year**	**Session:** 2025-26

Subject: Computer Application

1	Course Code	**M2**
2	Course Title	**Operating System Lab(Practical)**
3	Course Type (Core Course/Elective/Generic Elective/Vocational	**Core-Course**
4	Pre-Requisite(if any)	To study this course, a student must have had the class.

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BA III Semester

Major Paper- Database Management System

No. of Lectures (in hours per week): 2 Hrs. per week
Total No. of Lectures: 60

Maximum Marks: 60

Units	Topics	No. of Lectures
I	**Introduction: Database system concepts**:- Database system, Advantages of database systems; Data Architecture of data system: View/Schema, logical, conceptual and physical and their interrelationship, data dictionary, Data base administrator. Types of Data Models:- Relational, Hierarchical and Network Model their advantages and disadvantages	12
II	**Entity Relationship Model as a tool of conceptual design**: Entities &Entity set, Relationship & Relationship set, Attributes, Mapping Constraints, Keys, Entity-Relationship diagram (E-R diagram) : Strong & weak entities, Generalization, Specialization, Aggregation, Reducing ER diagram to tables.	12
III	Normalization and SQL concept :- Normalization: First, Second, Third & BCNF Normal Forms, Introduction to SQL,tuple, attribute, Data types, key constraints:- primary key, Candidate key, Integrity rules : Entity integrity, Referential integrity rule.SQL Commands:- , DDL, DML, DCL, TCL syntax and examples, select query with all the clauses. Like Predicate , Operator (Between, In , Not in)	12
IV	**Advance SQL**:- SQL join operations, Sub queries and correlated queries, SQL Functions. Constraints in SQL. Introduction to PL/SQL :- PL/SQL structure, Cursors, Triggers, Stored Procedures and functions.	12
V	**Functional Protection and Crash Recovery**: protection against crashes: different types of crashes; backup, journal, rollback, committed and uncommitted transactions, security on database	12

Text Books:

1. An Introduction to Database System by Bipin Desai.
2. —Database System Conceptsl by Abraham Silberschatz and S Sudarshan
3. —Database Management Systemsl by Raghu Ramakrishnan
4. —Fundamentals of Database Systemsl by R Elmasri and S Navathe
5. —Database Management Systemsl by Johannes Gehrke and Raghu Ramakrishnan
6. Books published by M.P. Hindi Granth Academy, Bhopal

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B.A III Semester

Subject:- Database Management System

Paper:- Open Elective

Maximum Marks: 60

Unit I

Introduction: Database system concepts, Data base system, Advantages of database systems; Data Architecture of data system: View/Schema, logical, conceptual and physical and their interrelationship, data dictionary, Data base administrator. Types of Data Models:- Relational, Hierarchical and Network Model their advantages and disadvantages

Unit II

Entity Relationship Model as a tool of conceptual design: Entities &Entity set, Relationship & Relationship set, Attributes, Mapping Constraints, Keys, Entity- Relationship diagram (E-R diagram) : Strong & weak entities, Generalization, Specialization, Aggregation, Reducing ER diagram to tables

Unit III

Normalization and SQL concept :- Normalization: First, Second, Third & BCNF Normal Forms, Introduction to SQL,tuple, attribute, Data types, key constraints:- primary key, Candidate key, Integrity rules : Entity integrity, Referential integrity rule.SQL Commands:- , DDL, DML, DCL, TCL syntax and examples, select query with all the clauses. Like Predicate , Operator (Between, In , Not in)

Unit IV

Advance SQL:- SQL join operations, Sub queries and correlated queries, SQL Functions. Constraints in SQL. Introduction to PL/SQL :-PL/SQL structure, Cursors, Triggers, Stored Procedures and functions.

Text Books:-

1. An Introduction to Database System by Bipin Desai.
2. —Database System Conceptsl by Abraham Silberschatz and S Sudarshan
3. —Database Management Systemsl by Raghu Ramakrishnan
4. —Fundamentals of Database Systemsl by R Elmasri and S Navathe
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B.A. IV Semester

Paper: - Major/Minor

Subject:- Introduction to ASP.NET& C#

Maximum Marks: 60

Units	Topics	No. of Lectures
I	**Introduction to .NET Framework:** Programming Platform .NET Framework, .NET Architecture, CLR, the Just-in-Time Compiler, C# - The Basics and Console Applications in C#: Introduction to C#., Visual development & event driven Programming Methods and events. Data type, type conversion. Variables constants, operators, Decision making, Loops, Arrays.	12
II	**Overview of OOPs:** Class, Object ,Encapsulation, inheritance, polymorphism, abstraction, Understanding Constructors and instance Variables Handling and Using Interfaces. Preprocessor directives, Exception handling, Understanding Delegates in c#. **Windows Forms and Controls:** The Windows Forms Model, Creating Windows Forms, Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs - ToolTips.	12
III	**Introduction to ASP.NET**:- ASP.NET Life Cycle, page life cycle phases, Understanding ASP.NET Controls, Web forms, Web form controls ,server controls, client controls, HTML controls ,Navigation controls..	12
IV	**Session Management** :- Event Handling- Application and Session Events, Page and Control Events. Validation controls: RequiredFieldvalidator , RangeValidator, CompareValidator ,RegularExpressionValidator, CustomValidator, ValidationSummary	12
V	**Database connectivity in ASP.NET:** Architecture of ADO.NET, Connection Class, Command Class, Data Adapter Class, and Dataset Class, Display data on web form using Data bound controls	12

Text Books:

1. ASP .NET Unleashed C# programming — Wrox Publication.
2. C# Programming Black Book by Matt Talles.
3. VB.NET Programming Black Book by st.evenholzner —dreamteef publications
4. Mastering VB.NET by Evangelospetroutsos- BPB publications
5. Introduction to .NET framework-Worx publication
6. Books published by M.P. Hindi Granth Academy, Bhopal

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B.A IV Semester

Paper:- Elective

Subject:-Introduction to ASP.NET & C#

Maximum Marks: 60

Units	Topics	No. of Lectures
I	**Introduction to .NET Framework**: Programming Platform .NET Framework, .NET Architecture, CLR, the Just-in-Time Compiler, C# - The Basics and Console Applications in C#: Introduction to C#., Visual development & event driven Programming Methods and events. Data type, type conversion. Variables constants, operators, Decision making, Loops, Arrays.	11
II	**Overview of OOPs**: Class, Object, Encapsulation, inheritance, polymorphism, abstraction, Understanding Constructors and instance Variables Handling and Using Interfaces. Preprocessor directives, Exception handling, Understanding Delegates in c#. **Windows Forms and Controls:** The Windows Forms Model, Creating Windows Forms, Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs - ToolTips.	11
III	**Introduction to ASP.NET**:- ASP.NET Life Cycle, page life cycle phases, Understanding ASP.NET Controls, Web forms, Web form controls ,server controls, client controls, HTML controls ,Navigation controls.	12
IV	**Session Management** :- Event Handling- Application and Session Events, Page and Control Events. Validation controls: RequiredFieldvalidator, RangeValidator, CompareValidator, RegularExpressionValidator, CustomValidator, ValidationSummary **Database connectivity in ASP.NET**: Architecture of ADO.NET, Connection Class, Command Class, Data Adapter Class, and Dataset Class, Display data on web form using Data bound controls.	11

Text Books:

1. ASP .NET Unleashed C# programming — Wrox Publication.
2. C# Programming Black Book by Matt Talles.
3. VB.NET Programming Black Book by st.evenholzner —dreamteef publications
4. Mastering VB.NET by Evangelospetroutsos- BPB publications
5. Introduction to .NET framework-Worx publication
6. Books published by M.P. Hindi Granth Academy, Bhopal

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BA V Semester **Paper-Core**

Operating System
Content of the Course
Theory

Total No. of Lectures: 60 Hrs. **Maximum Marks:** 60

Units	Topics	No. of Lectures
I	Introduction: Evolution of operating system, Types of operating system, Different view of operating system, Operating system concepts and structures. Processes: The process concept, system programmer's view of process, Operating system services for process management, Scheduling Algorithm, Performance evaluation.	12
II	Memory Management: Memory management without swapping or paging, swapping, virtual memory, page replacement algorithm, modeling paging algorithm, design issue for paging system, segmentation.	12
III	Inter-Process communication and synchronization: The need for inter-process synchronization mutual exclusion, semaphores, hardware support for mutual exclusion, implementation of semaphores, classical problem in concurrent programming, critical region and conditional critical region, monitors, messages.	12
IV	File System: File systems, directories, file system implementation, security protection mechanisms. Input / output: Principles of I/O Hardware: I/O devices, device controller, direct memory access. Principles of I/O software: Goals interrupt handlers, device driver, device independent I/O software.	12
V	Deadlock: Deadlock prevention, Deadlock avoidance. Disks: Disk hardware, scheduling algorithms, Error handling, track at a time caching, RAM disks. Clocks: Clock hardware, memory mapped terminals, I/O software.	12

References

Text Books:

- Operating System concepts – Avi silberschatz and Peter Galvin.
- Operating System: Internals and Design principles by William Stallings.
- Operating System: A design-oriented approach by Charles Crowley

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BA V Semester

DSE

Programming using JAVA

Maximum Marks-60

Unit	Topics	Lectures
I	The Java Environment: History and features of java, C++ VS java, JAVA Program Structure, Java Virtual Machine concepts, Primitive data types, variables and constants, operators, expression, **Statements**-branching, looping and jumping.	15
II	Object Oriented Programming in Java: Classes, objects and methods: defining a class, adding variables and methods, creating objects, constructor, Instances, field and methods initialization by constructors, Copy constructor. Arrays, String classes, Wrapper classes.	15
III	Inheritance: Inheritance basics, Super class, Sub-class, Method overloading, abstract classes. Interfaces: defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces.	15
IV	Multithreading and Exception Handling: Basic idea of multithreaded programming; The lifecycle of a thread, Creating thread with the thread class and runnable interface, Basic idea of exception handling: The try, catch and finally.	15
V	Applet programming-Local and Remote Applets, Applet Vs Application, creating and executing java applets, inserting applets in a web page, passing parameter to applets, Applet Tag, Getting Input from User.	15

Suggested Readings

- Java A Complete reference by Herbert Schildt, Mc Graw hill publication
- Thinking in Java (3rd edition) Bruce Eckel , Prentice Hall
- The Java Language Specification, Java SE 8 , Cay S. Horstmann, Gary Cornell, Prentice Hall
- Core Java an Integrated Approach (Black Book), Dr. R. Nageswara Rao, Prentice Hall

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BA VI Sem

Core

Computer Networks

Content Of the Course

Computer Networks

Total No. of Lectures =90 (in hours per week) 3-0-0

Unit	Topics	No. of Lectures
I	**Overview** : Goals & Applications, Network Hardware: LAN,MAN,WAN and Internet, Wireless networks, Inter Networks, Network Software: Protocol Hierarchies, Design Issues, Interfaces and Services, Connection Oriented And Connection less Services, Service Primitives.	18
II	**Introduction to Network**, OSI reference model, TCP/IP reference model. Transmission Media: Magnetic Media, Twisted-Pair cables, Baseband & Broadband Coaxial cables, Fiber Optics. Wireless Transmission: Radio Transmission, Microwave Transmission.	18
III	**Data Link Layer:** Framing, Error Control, DLC Protocols: Simplex, Stop-and-Wait, Sliding Window protocol HDLC. Medium Access Sub Layer: Sliding Window Protocol. Static & Dynamic Channel allocation in LANs & MANs. ALOHA & slotted ALOHA.	18
IV	**Network Layer:** Design Issues : Virtual Circuits and Datagram, Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : Internet address, classful address. Routing algorithms: Optimality principle, Shortest path routing – Dijkstra, bellman-ford, flooding and broadcasting, distance vector routing, link state routing, flow based routing, multicasting, routing.	18
V	**Transport Layer**: Services & Protocols (TCP and UDP), congestion control **Presentation and Application Layer:** Presentation concepts, Cryptography: Substitution and transposition, ciphers Application Layer: Network Security, DNS, SNMP, E-mail, WWW, Network Multimedia Applications..	18

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BA VI Semester

DSE

Part- B: Content of the Course
Multimedia Tools and Applications

Total No. of Lectures =60 (in hours per week) :2-0-0

Unit	Topics	No. of Lectures
I	**Introduction to Multimedia:** Basic Concept, Definition, Components & Applications of Multimedia; Hypermedia and Multimedia; Multimedia Hardware and Software; Multimedia Software Tools; Presentation Tools.	12
II	**Text:** Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext. **Images**: Still Images – bitmaps, vector drawing, 3D drawing & rendering, Basic steps for image processing, Color Management System (CMS), natural light & colors, computerized colors, color palettes, image file formats.	12
III	**Digital Audio and Video:** Characteristics of sound and Digital audio, Digital Audio systems, MIDI, Audio file formats, Characteristics of digital video, Using Audio in Multimedia Applications. **Quantization and Transmission of Audio:** Coding of Audio; Pulse Code Modulation; Differential Coding of Audio; Lossless Predictive Coding; DPCM; DM; ADPCM.	12
IV	**Multimedia Authoring:** Introduction, Features, Types of Authoring Tools: Card or Page-Based, Icon-Based, Time-Based, Object-Oriented; Multimedia tool selection, Tool feature, selecting the right authoring paradigm.	12
V	**Compression Techniques:** Introduction, Lossless Compression Techniques, Huffman Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy Compression Techniques, JPEG image compression, Audio compression, Video compression.	12
	Part C: Learning Resource **Text Books, Reference Books, Other resources**	
	Suggested Readings: 1. Ramesh Bangia, "Multimedia and Web Technology", Firewall Media. 2. P. K. and Leigh, Kiran Thakrar Multimedia System Design. 3. Ana Weston Solomon, "Introduction to Multimedia", Tata McGraw-Hill.	

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BA VI Semester

DSE

Internet and its Applications

TotalNo.ofLectures =60(inhours per week):2-0-0

Unit	Topics	No. of Lectures (1 hour each)
I	Evolution of Internet, TCP/IP; addressing and routing.Internet applications: FTP, Telnet, Email, Chat.World Wide Web: HTTP protocol. Internet Concept of Internet Applications of Internet Connecting to the Internet Troubleshooting Communication using the Internet Concept of Internet; Applications of Internet, Understanding of Internet of things; connecting to internet; What is ISP; Knowing the Internet; Basics of internet connectivity related troubleshooting.	12
II	Basics of Computer networks; LAN, WAN; Network Models: Client/ server network and Peer-to-peer network, OSI, TCP/IP, layers and functionalities. Transmission Media: Introduction, Guided Media: Twisted pair, Coaxial cable, Optical fiber. Unguided media: Microwave, Radio frequency propagation, Satellite. LAN Topologies: Ring, bus, star, mesh and tree topologies. Network Devices: NIC, repeaters, hub, bridge, switch, gateway and router.	12
III	Introduction Objectives World Wide Web (WWW) Web Browsing Softwares Popular Web Browsing Softwares Search Engines Popular Search Engines / Search for content Accessing Web Browser Using Favorites Folder Downloading Web Pages Printing Web Pages Understanding URL Surfing the web Using e-governance website Basics of E-mail What is an Electronic Mail Email Addressing Using E-mails Opening Email account Mailbox: Inbox and Outbox Creating and Sending a new E-mail Replying to an E-mail message Forwarding an E-mail message Sorting and Searching emails Document collaboration Instant Messaging and Collaboration Using Instant messaging Instant messaging providers	12
IV	HTML5 syntax, validation, elements, variety of input elements and attributes, Forms and Form widgets/elements (menus, sliders, etc.), tables, images, hyperlinks, directory navigation notation, div and span elements, HTML5 semantic elements like headers. Browser variations. Use of AFS environment and Secure Shell.Use of high-level HTML editorslike Expression Web for implementation and self-instruction.	12
V	PHP for server-side scripting and database interaction, syntax, interaction with HTML Forms, scripts as intermediaries to background databases. Design and implementation of programmer defined functions. Embedded SQL queries, use in 3-tier applications, diagnosing errors, syntax checking tools, debugging. PHP versus MySQL versus HTML errors in PHP scripts. HTML wrappers for database content. Miscellaneous other PHP features. Brief introduction to HTTP, domain names, ports, TCP connections, connecting to a remote host in telnet, UNIX terminal window and commands, GET and POST commands, HTTP message headers and message bodies, understanding the usefulness of HTTP headers.	12

Suggested Readings:

- Andrew S. Tanenbaum, David J. Wetherall Computer Networks (5th Edition),PHI, 2010
- B. A. Forouzan, Data Communication and Networking , TMH,2003.
- D.R. Brooks, An Introduction to HTML and Javascript for Scientists and Engineers, Springer