MK UNIVERSITY

PATAN- GUJARAT

Scheme of Examination for PGDCA

As per NEP 2020

Curriculum and Credit Framework for Postgraduate Programme
With Multiple Entry-Exit, Internship and
Outcome Based Education System/Learning Outcome Curriculum Framework

WITH EFFECT FROM THE SESSION 2024-25

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

FACULTY OF ENGINEERING & TECHNOLOGY

Sr. No.	Full form	Abbreviation	Description
1	Core Course	CC	Compulsory core courses for the programme. CC will be a theory course of 4 credits.
2	Discipline Elective Course	DEC	Elective Courses offered by the DCI. A student can opt one course out of 4 given options for that DEC course. One course can be opted in a semester through MOOCs from SWAYAM or other portals. DEC will be a theory course of 4 credits.
3	Practicum	PC	Practical course of 4 credits which will be compulsory in all semesters for all students except in the 4th Semester when a student opts Dissertation work.
4	Seminar	S	The seminar is a Skill Enhancement Course (SEC) aiming to impart skills of self-learning, comprehension, communication and presentation.
5	Constitutional, Human, Moral Values and IPR	CHM	CHM is a compulsory Value Added theory Course of 2 credits.
6	Open Elective Course	OEC	OEC is a Multidisciplinary course of 2 credits. Every student will opt for a course from the pool of OEC courses other than Computer Science.
7	Employability and Entrepreneurship Skills Course	EEC	EEC is a Vocational or SEC course aiming to increase the employment and entrepreneurship potential of students of programme.
8	Theory	Th	
9	Practical	P	
9	Lecture	L	
10	Tutorial	T	
11	Dissertation	D	A research course of 12 credits, where a student will undertake research work and submit a dissertation as per rules prescribed by the university.
12	Programme Learning Outcomes	PLOs	
13	Course Learning Outcomes	CLOs	

Name of the Programme : PGDCA
Duration of the Programme : One Year (Two Semesters)
Total Credits for the Programme : 52+ 4 Credits

VISION AND MISSION OF THE DEPARTMENT

VISION

To train students to be highly effective instructors, researchers, and contributors to IT companies globally. Be regarded as a prestigious centre of scholarly achievement worldwide.

MISSION

1. To advance research and education in IT domain.
2. To create skilled employees for businesses and industries based on latest IT technologies like artificial intelligence, data science and IoT etc.
3. To offer learning environments that are centered on the needs of the students in order to help them develop as people as a whole.

Programme Learning Outcomes (PLOs): As per NEP-2020, PLOs include outcomes specific to disciplinary areas of learning associated with the chosen field (s) of learning as well as generic learning outcomes. These also include transferable skills and competencies that post-graduates of all programmes of study should acquire and be able to demonstrate for the award of the Degree. The programme learning outcomes would also focus on knowledge and skills that prepare students for further study, employment, research, and responsible citizenship. The PLOs of the **PGDCA** programme are stated as per the following domains:

PLOs	After the completion of PGDCA, a student will be able to:
PLO-1: Knowledge and Understanding	Demonstrate the deep understanding and advanced knowledge in the core areas of Computer Science subject and understanding of recent developments and issues, including concepts, theories, principles, methods, and techniques in different areas of Computer Science.
PLO-2: General Skills	Acquire the general skills required for performing and accomplishing the tasks as expected to be done by a skilled professional in the fields of Computer Science.
PLO-3: Technical/ Professional Skills	Demonstrate the learning of advanced cognitive computing, programming, formulating models, using various software, and other teaching and professional skills required for completing the specialized tasks related to the profession and for conducting and analyzing the relevant research tasks in different domains of Computer Science.

PLO-4: Communication Skills	Effectively communicate the attained skills in different areas of Computer Science in a precise, well-structured, and unambiguous mathematical language through effective oral and/or written expressions to the society at large.
PLO-5: Application of Knowledge and Skills	Apply the acquired knowledge and skills to the problems in the subject area, and identify and analyse the issues where the attained knowledge and skills can be applied by carrying out various industry-oriented projects and/or research investigations to formulate appropriate solutions to various problems ranging from basic to complex and unpredictable problems associated with the field of Computer Science or allied fields.
PLO-6: Critical Thinking and Research Aptitude	Attain the capabilities of critical thinking, logical reasoning, investigating problems, analysis, problem-solving, and application of computer science methods/techniques, in intra/inter-disciplinary areas of Computer Science, enabling to develop skills to solve problems having applications in other disciplines and/or in the real world and to formulate, synthesize, and articulate issues for analyzing, designing, and implementing of project/research proposals, testing hypotheses, and drawing inferences based on the analysis.
PLO-7: Constitutional, Humanistic, Moral Values and Ethics	Know constitutional, humanistic, moral and ethical values, and intellectual property rights to become a scholar/professional with ingrained values in expanding knowledge for the society, and to avoid unethical practices such as fabrication, falsification or misrepresentation of data or committing plagiarism.
PLO-8: Capabilities/ qualities and mindset	To exercise personal responsibility for the outputs of own work as well as of group/team and for managing complex and challenging work(s) that requires new/strategic approaches.
PLO-9: Employability and job- ready skills	Attain the knowledge and skills required for increasing employment potential, adapting to the future work and responding to the rapidly changing demands of the employers/industry/society with time, and to have strong foundation in basic and applied aspects of Computer Science so as to venture into research in different areas of computer science, jobs in scientific and various industrial sectors and/or teaching career in Computer Science.

INSTRUCTIONS FOR THE STUDENTS

Course: Course refers to a paper having specified credits which is a component of a programme in a discipline/subject. The course defines the learning objectives and learning outcomes. A course may be designed comprising credits for lectures/tutorials/laboratory work/field work/outreach activities/project work/internship/vocational training etc. or combination thereof.

Research thesis/Project: Research thesis/Project is a course involving applications of knowledge in exploring, analyzing and solving real-life situations/problems.

Semester/Academic Year A semester comprises 90 working days and an academic year is divided into two semesters.

Academic Bank of Credit (ABC): Academic Bank of credit is an academic service mechanism to facilitate students to become its academic account holders, thereby paving the

way for seamless student mobility between or within degree-granting Higher Educational Institutions through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed and flexible teaching-learning. ABC will digitally store the academic credits earned by students from HEIs registered with ABC for awarding degrees/diplomas/certificates taking into account credits earned by students.

Credit Point: It is the product of the grade point and the number of credits for a course.

Grade Point: A numerical weight is allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

Semester Grade Point Average (SGPA): The SGPA is the ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

Cumulative Grade Point Average (CGPA): The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses. It is expressed up to two decimal places.

Framework-2 Scheme-P

PGDCA First Year Semester-I

Course Type	Course Code	Nomenclature of course	Theory (Th)/ Practical P)/ Seminar/ CHM/OEC/ EEC/ Dissertation/ Project Work	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
				Course	Semester Total	L	T	P	Total				
MAJOR	PGDCA101	Data Structures and Algorithms	Th	4	26	4	0	0	4	30	70	100	3
MAJOR	PGDCA102	Database Design Concepts	Th	4		4	0	0	4	30	70	100	3
MAJOR	PGDCA103	Distributed Operating System	Th	4		4	0	0	4	30	70	100	3
MAJOR	PGDCA104	Computer Organization and Architecture	Th	4		4	0	0	4	30	70	100	3
MINOR	PGDCA105	Practical -1 (Data Structures and Algorithms, C++)	P	4		0	0	8	8	30	70	100	4
MINOR	PGDCA106	Practical -2 (Database Design Concepts, Microsoft Azure)	P	4		0	0	8	8	30	70	100	4
MINOR	PGDCA107	Business Communication	Th	2		2	0	0	2	20	30	50	2

PGDCA First Year Semester - II

Course Type	Course Code	Nomenclature of course	Theory (Th)/ Practical P)/ Seminar/ CHM/OEC/ EEC/ Dissertation/ Project Work	Credits		Contact hours per week L: Lecture P: Practical T: Tutorial				Internal Assessment Marks	End Term Examination Marks	Total Marks	Examination hours
				Course	Semester Total	L	T	P	Total				
MAJOR	PGDCA201	Object Oriented Programming with Java	Th	4	)	4	0	0	4	30	70	100	3
MAJOR	PGDCA202	Computer Graphics & Multimedia	Th	4		4	0	0	4	30	70	100	3
MAJOR	PGDCA203	Computer Networks	Th	4		4	0	0	4	30	70	100	3
MAJOR	PGDCA204	Theory of Computation	Th	4		4	0	0	4	30	70	100	3
MINOR	PGDCA205	Practical -3 (Java, Tableau Data Visualization)	P	4		0	0	8	8	30	70	100	4
	PGDCA206												
MINOR	PGDCA207	Practical -4 (Computer Graphics, MongoDB)	P	4		0	0	8	8	30	70	100	4
MINOR	PGDCA208	Constitutional, Human and Moral Values, and IPR	Th	2		2	0	0	2	15	35	50	3
MINOR Internship	PGDCA209	An internship course of 4 Credits of 4-6 weeks duration during summer vacation after 2nd semester is to be completed by every student. Internships can be either for enhancing the employability or for developing the research aptitude.								50	50	100	

Table-1

Course composition- Theory/ Theory +Tutorial			
Course Credit	**Internal Assessment marks**	**End term exam marks**	**Total marks**
2	**20**	**30**	**50**
4	**30**	**70**	**100**

Table-2: Course composition- Theory + Practical

Course Credit	Theory		Practical		Total marks
Theory +Practical	**Internal Assessment marks**	**End term exam marks**	**Internal Assessment marks**	**End term exam marks**	
2+0	**20**	**30**	**-**	**-**	**50**
4+**0**	**30**	**70**	**-**	**-**	**100**
0+4	**-**	**-**	**30**	**70**	**100**

Table- 3: Distribution of Internal Assessment Marks (Theory)

Total Internal Assessment Marks (Theory)	Class Participation	Seminar/Presentation/Assignment/ Quiz/class test, etc.	Mid-Term Exam
20	**5**	**5**	**10**
30	**5**	**5**	**20**

Table -4 Distribution of Internal Assessment Marks (Practical)

Total Internal Assessment Marks (Practicum)	Class Participation	Seminar/Demonstration/Viva-Voce/ Lab record, etc.	Mid-Term Exam
30	**5**	**10**	**15**

PGDCA 1st year
Semester I

PGDCA101-Data Structures and Algorithms

With effect from Session: 2025-26		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	1st	
Name of the Course	Data structures and algorithms	
Course Code	PGDCA101	
Course Type	MAJOR	
Level of the course (As per Annexure I)		
Prerequisite for the course (if any)		
Curse Objectives	1. Understands about algorithms writing and the fundamental approach of data structures to solvingproblems. 2. It helps to understand concepts about searching and sorting techniques as well as other data structure technique which are used to solve the particular problem using the basic concepts such as stacks, queues, lists, trees and graphs.	
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes** CLO1: Ability to analyze algorithms and algorithm correctness. CLO2: Ability to summarize searching and sorting techniques. CLO3: Ability to describe stack, queue and linked list operation. CLO4: Ability to have knowledge of tree and graphs concepts. CLO5: Describe the hash function and concepts of collision and its resolution methods CLO6: Solve problem involving graphs, trees and heaps.	
Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours
Part B Contents of the Course		

Learning Objectives:

1. **Understands about algorithms writing and the fundamental approach of data structures to solving problems.**
2. **It helps to understand concepts about searching and sorting techniques as well as other data structure technique which are used to solve the particular problem using the basic concepts such as stacks, queues, lists, trees and graphs.**

Unit	Topics		Contact Hours
I	Definition, Classification of data structures, Operations on data structures, Design and analysis of algorithm, Top down and bottom up approaches to Algorithm design. Frequency count, Complexity. Arrays: Address calculation using column and row major ordering. Various operations on Arrays, Vectors, Application of arrays: Matrix multiplication, sparse polynomial representation and addition.	5	1
II	Stacks and Queues: Introduction, Operations, Representation using arrays and linked list. Circular queues, Priority Queue and De Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks. Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, doubly linked lists.	5	1
III	Binary tree traversal methods: Preorder, In order, Post ordered. Recursive Algorithms. Traversal methods. Binary tree representation of a general tree. Conversion of forest into tree. Threaded binary trees. Binary search tree: Height balanced (AVL) tree, B trees. Sorting: Selection sort, Insertion sort, Bubble sort, Quick sort, merge sort, Heap sort, Radix sort and their complexities.	5	1
IV	Searching, sorting and complexity, Hashing Schemes. Comparison of time complexity. Graph representation: Adjacency matrix, Adjacency lists, Depth first search, Breadth first search. Spanning tree: Definition, Minimal spanning tree algorithms. Shortest Path algorithms (Prim's and Kruskal's). File Structures: File Organization, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.	5	1
Total Contact Hours			60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid-term Exam:	20		

Part C-Learning Resources

Reference Books:

1. **Hubbard JR: Schaum"s outline of Data Structures with C++, TMH.**
2. **R. Sedgewick: Algorithms in C++, Pearson Education Asia.**
3. **Y. Langsam, M. J. Augenstein and A. M. Tannenbaum: Data Structures Using C and C++, Prentice Hall of India.**
4. **R.Kruse, C.L.Tonodo and B.Leung: Data Structures and Program Design in C, Pearson Education.**
5. **S. Chottopadhyay, D. Ghoshdastidar & M. Chottopadhyay: Data Structures through C Language, BPB Publication.**
6. **G.L. Heileman: Data Structutes, Algorithms and Object Oriented Programming, Tata McGraw Hill. 7. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++, Galgotia Publiction.**

PGDCA102 - Database Design Concepts

With effect from Session: 2024-25

Part A – Introduction

Name of the Programme	PGDCA
Semester	1st
Name of the Course	Database design concepts
Course Code	PGDCA102
Course Type	MAJOR
Level of the course (As per Annexure I	
Prerequisite for the course (if any)	
Course Objectives	1. Database Management Systems, provides an introduction to the students about management of database systems. 2. This course will emphasize on the understanding of the fundamentals of relational systems including data models, architectures, and manipulations. 3. It will also cover an understanding of new developments trends such as Internet database environment and data warehousing as well as a problembased approach to learning.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	**Course Outcomes** CLO1: To introduce the concept of Data Abstraction & Data Independence. CLO2: To describe the factors various Data base Models. CLO3: To apply the concept of Relational query Languages. CLO4: To impart knowledge of Query Processing optimization with the help of Algorithms. CLO5: To know about the storage strategies including Hashing. CLO6: To instruct about the Transaction Processing.

Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours

Part B Contents of the Course

Learning Objectives:

1. **Database Management Systems, provides an introduction to the students about management of database systems.**
2. **This course will emphasize on the understanding of the fundamentals of relational systems including data models, architectures, and manipulations.**
3. **It will also cover an understanding of new developments trends such as Internet database environment and data warehousing as well as a problem-based approach to learning.**

Unit	Topics	Contact Hours
I	Introduction to Database, features, Applications, data base System Vs. File Processing System, Instances and Schemas. Data Models – Hierarchical, Network, Relational Model. Database Access for applications Programs – data base Users and Administrator, Data Independence, Data base System Architecture. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, and Conceptual Design for Large enterprises.	1 5
II	Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, querying relational data, Logical data base Design, Introduction to Views, Destroying /altering Tables and Views. Relational Algebra and Calculus: Relational Algebra, Selection and projection set operations, renaming, Joins, Division, Examples of Algebra overviews, Query Processor, Codd's 12 Rules. Relational calculus–Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.	1 5
III	Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries Set, Comparison Operators, NULL values, Comparison using Null values, Logical connectivity's – AND, OR and NOT. Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Databases. Database Languages – DDL, DML, DCL and Its commands. Schema refinement, Problems Caused by redundancy, Decompositions, Problem related to decomposition, Normalization: FIRST to FIFTH Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Schema refinement in Data base Design, Multi valued Dependencies.	1 5

IV	Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking, Introduction to Crash recovery. Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques.	1 5
	Total Contact Hours	6 0

Suggested Evaluation Methods			
Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid Term Exam:	20		

Part C-Learning Resources

Reference Books:

1. **Silberschatz, Korth: Data base System Concepts, McGraw Hill, and latest edition.**
2. **P. Radha Krishna: Database Management Systems, HITECH Publications.**
3. **C.J.Date: Introduction to Database Systems, Pearson Education.**
4. **Gupta,S.B., Aditya Mittal, Introduction to Data base Management System, University Science Press, New Delhi.**
5. **Elmasri Navrate: Data base Management System, Pearson Education.**

PGDCA103-Distributed Operating System		
With effect from Session: 2024-25		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	1st	
Name of the Course	Distributed operating system	
Course Code	PGDCA103	
Course Type	MAJOR	
Level of the course (As per Annexure I		
Prerequisite for the course (if any)		
Course Objectives	1. The objective of this course is to provide students with a thorough understanding of the fundamental concepts, architectures, and challenges of distributed systems. 2. Students will gain the knowledge and skills to analyze, design, and implement distributed applications while considering critical aspects like communication, fault tolerance, and security.	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	**Course Outcomes** CLO1: Understand core concepts of distributed systems. CLO2: Classify different system types. CLO3: Analyze communication mechanisms. CLO4: Design client-server and peer to peer systems. CLO5: Utilize middleware and distributed objects. CLO6: Manage clock synchronization and mutual exclusion. CLO7: Implement election algorithms for leader selection. CLO8: Design fault tolerant distributed systems. CLO9: Implement secure distributed file systems.	
Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours
Part B Contents of the Course		

Learning Objectives:

1. **Learn the fundamental principles, architectures of distributed systems, i.e. transparency, scalability, and fault tolerance**
2. **Explore communication protocols mechanisms such as message passing, remote procedure calls (RPCs)**
3. **Study algorithms and techniques for synchronizing and coordinating distributed processes, including mutual exclusion, leader election, and clock synchronization.**

Unit	Topics	Contact Hours
I	Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS- Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Definition and Characteristics: Types (homogeneous, heterogeneous), advantages (scalability, fault tolerance), challenges (latency, security). Types of Distributed Systems: Client-server (web services, email), peer to peer (file sharing, block chain), hybrid systems. Communication: Sockets (TCP, UDP), Remote Procedure Calls (RPC), message passing (synchronous, asynchronous).	15
II	Client Server Model: Concepts, architectures (thin client, thick client), examples (web applications, email). Peer to Peer Systems: Concepts, architectures (structured, unstructured), examples (BitTorrent, blockchain). Middleware: Concepts, types (message oriented, object oriented, service oriented), applications (CORBA, DCOM). Distributed Objects: Concepts, architectures (CORBA, DCOM), applications (distributed databases, remote method invocation).	15
III	Clock Synchronization: Logical clocks (Lamport's timestamps), vector clocks, applications (distributed debugging, event ordering). Distributed Mutual Exclusion: Algorithms (RicartAgrawala, Maekawa's), analysis (message complexity, fairness). Election Algorithms: Bully algorithm, Ring algorithm, applications (leader election, coordinator selection).	15
IV	Fault Tolerance: Concepts, techniques (replication, check pointing, rollback recovery), examples (distributed databases, cloud computing). Distributed File Systems: Concepts, architectures (NFS, AFS), examples (Google File System, Hadoop Distributed File System). Security: Threats (eavesdropping, tampering, impersonation), mechanisms (encryption, authentication, authorization), protocols (SSL/TLS, Kerberos).	15
	Total Contact Hours	60

Suggested Evaluation Methods			
Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	

Seminar/presentation/assignment/quiz/class test etc.:	5
Mid-Term Exam:	20

Part C Learning Resources

Reference Books:

1. **Andrew s. Tanenbaum: distributed operating systems.**
2. **Andrew s tanenbaum distributed operating systems | pearson education limited**
3. **Distributed operating systems and algorithm analysis | randy chow, theodore johnson | pearson**
4. **Fundamental of distributed operating system by shubhra garg , s.k. kataria & sons**
5. **Distributed operating systems concepts and designpradeep k. Sinha**

PGDCA104-Computer Organization and Architecture

With effect from Session: 2024-25

Part A – Introduction

Name of the Programme	PGDCA
Semester	1st
Name of the Course	Computer organization and architecture
Course Code	PGDCA104
Course Type	CC4
Level of the course (As per Annexure I	
Prerequisite for the course (if any)	
	1. How Computer Systems work & the basic principles 2. Instruction Level Architecture and Instruction Execution 3. The current state of art in memory system design 4. How I/O devices are accessed and its principles.
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	**Course Outcomes** ClO1: Understand the theory and architecture of central processing unit. CLO2: Analyze some of the design issues in terms of speed, technology, cost, performance. CLO3: Design a simple CPU with applying the theory concepts. CLO4: Use appropriate tools to design verify and test the CPU architecture. CLO5: Learn the concepts of parallel processing, pipelining and inter processor communication. CO6: Analyze the performance of commercially available computers.

Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours	0	

Part B Contents of the Course

Learning Objectives:

1. **How Computer Systems work & the basic principles**
2. **Instruction Level Architecture and Instruction Execution 3. The current state of art in memory system design**
4. **How I/O devices are accessed and its principles.**

Unit	**Topics**	**Contact Hours**

I	Functional blocks of a computer: CPU, memory, input/output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs. Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look ahead adder, etc. multiplication – shift and add, Booth multiplier, carry save multiplier, etc. Division restoring and no restoring techniques, floating point arithmetic.	15
II	Introduction to x86 architecture. CPU control unit design: hardwired and microprogrammed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input/output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and no privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB	15
III	Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.	15
IV	Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	15
	Total Contact Hours	60

Suggested Evaluation Methods			
Internal Assessment: 30		**End Term Examination: 70**	
Theory	30	**Theory**	70
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	10		
Midterm Exam:	15		

Part C-Learning Resources

Reference Books:

1. **"Computer System Architecture", 3rd Edition by M. Morris Mano, Pearson.**
2. **Computer System Architecture and Organization: by Usha, Wiley India Ltd.**
3. **"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.**
4. **"Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGrawHill Higher Education.**

PGDCA105- Practical 1 C++		
With effect from Session: 2024-25		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	1st	
Name of the Course	Practical 1 C++	
Course Code	PGDCA105	
Course Type	MINOR	
Level of the course (As per Annexure I		
Prerequisite for the course (if any)		
Course Objectives	1. To introduce the fundamental concepts of Object-oriented Programming (OOP) using C++, including classes, objects, encapsulation, inheritance, polymorphism, and operator overloading. 2. This will enable students to create modular, reusable, and maintainable code. To equip students with the ability to design, develop, and implement object-oriented programs in C++. 3. This includes understanding object-oriented design principles, writing wellstructured code, and effectively utilizing C++ features like constructors, destructors, member functions, and inheritance hierarchies.	
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Grasp OOP fundamentals and C++ basics (data types, variables, functions, etc.). CLO2: Design and implement classes using access specifiers, constructors, destructors, and member functions. CLO3: Apply inheritance, polymorphism (overloading, overriding), and operator overloading. CLO4: Manage memory, implement object copying, and use templates and the STL. CLO5: Understand namespaces and object-oriented design principles.	
Credits	Practical	Total
	4	4
Teaching Hours per week	8	8
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	4 Hours	4 Hours
Part B Contents of the Course		

Learning Objectives:

1. **To introduce the fundamental concepts of Object-oriented Programming (OOP) using C++, including classes, objects, encapsulation, inheritance, polymorphism, and operator overloading.**
2. **This will enable students to create modular, reusable, and maintainable code. To equip students with the ability to design, develop, and implement object-oriented programs in C++. This includes understanding object-oriented design principles, writing well-structured code, and effectively utilizing C++ features like constructors, destructors, member functions, and inheritance hierarchies.**

Unit	Topics	Contact Hours
I	Introduction to object-oriented programming, user defined types, structures, unions, polymorphism, and encapsulation. Getting started with C++ syntax, datatype, variables, strings, functions, and default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.	15
II	Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references. Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors. Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.	15
III	Operator Overloading: This pointer, applications of this pointer, Operator function, member and non-member operator function, operator overloading, I/O operators. Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration, unexpected exceptions, exception when handling exceptions, resource capture and release.	15
IV	Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor. Template: template classes, template functions. Standard Template Library: Fundamental idea about string, iterators, hashes, iostreams and other types. Namespaces: user defined namespaces, namespaces provided by library. Object Oriented Design, design and programming, role of classes.	15
Total Contact Hours		60

Suggested Evaluation Methods			
Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Midterm Exam:	20		

Part C-Learning Resources

Reference Books:

1 **Big C++ Wiley India**

2 **C++: The Complete Reference Schildt, McGrawHill Education (India) 3 C++ and Object Oriented Programming – Jana, PHI Learning.**

4 **Object Oriented Programming with C++ Rajiv Sahay, Oxford**

5 **Mastering C++ Venugopal, McGrawHill Education (India)**

6 **Object Oriented Programming with C++ by E. Balaguru samy, Mc Graw Hill Education (India) 7 ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education**

PGDCA106-Microsoft Azure Lab Syllabus

With effect from Session: 2024-25			
Part A – Introduction			
Name of the Programme	PGDCA		
Semester	1st		
Name of the Course	**Azure Lab Syllabus**		
Course Code	PGDCA106		
Course Type	MINOR		
Level of the course (As per Annexure I			
Prerequisite for the course (if any)			
Course Objectives	1. This course aims to equip students with the knowledge and skills to leverage Microsoft Azure, a leading cloud computing platform. 2. Students will gain an understanding of core Azure services, deployment models, and best practices for building and managing cloud solutions.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understand cloud computing fundamentals and Azure services. CLO2: Set up and manage Azure VMs, storage, networking, and databases. CLO3: Develop and deploy cloud applications using Azure services. CLO4: Implement CI/CD pipelines and monitor Azure resources. CLO5: Design a cloud solution through a capstone project.		
Credits	Theory	Practical	Total
	0	4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100
Examination Time	0 hours	4 Hours	4 Hours
Part B Contents of the Course			
Learning Objectives: 1 **This course aims to equip students with the knowledge and skills to leverage Microsoft Azure, a leading cloud computing platform.** 2 **Students will gain an understanding of core Azure services, deployment models, and best practices for building and managing cloud solutions.**			
Unit	**Topics**		**Contact Hours**

I	Introduction to Cloud Computing and Azure: Overview of cloud computing, Introduction to Microsoft Azure, Azure services and architecture, Setting up an Azure account. Azure Virtual Machines: Creating and configuring VMs, Managing VM instances, VM scaling and availability, VM networking. Azure Storage Solutions: Introduction to Azure Storage, Blob, File, Queue, and Table storage, Managing storage accounts, Data redundancy and replication.	15
II	Azure Networking: Virtual networks , Subnets and IP addressing, Network security groups, VPN gateways and ExpressRoute. Azure App Services: Introduction to App Services, Creating and managing web apps, App Service plans, Deployment slots and scaling. Azure Databases: Azure SQL Database, Cosmos DB , Database migration, Managing and monitoring databases.	15
III	Azure Identity and Access Management: Azure Active Directory, Role based access control (RBAC), Multifactor authentication, and Identity protection. Azure DevOps: Introduction to Azure DevOpS, Continuous integration and delivery (CI/CD), Managing pipelines , Infrastructure as code (IaC).	15
IV	Monitoring and Management: Azure Mon, Log Analytic, Application Insights , Security Center. Advanced Topics and Project Work: Advanced networking and security, Integration with other cloud services, Capstone project: Design and implement a cloudbased solution.	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid-term Exam:	20		

Part C-Learning Resources

Reference Books:

1. **Learning Microsoft Azure: Cloud Computing and Development Fundamentals, Jonah Andersson**
2. **Cloud Computing with the Windows Azure Platform, Roger Jennings**
3. **Microsoft Azure for Dummies, Timothy L. Warner**

PGDCA107-Business Communication

With effect from Session: 2024-25			
Part A – Introduction			
Name of the Programme	PGDCA		
Semester	1st		
Name of the Course	**Business Communication**		
Course Code	PGDCA107		
Course Type	MINOR		
Level of the course (As per Annexure I			
Prerequisite for the course (if any)			
Course Objectives	1.To provide an over view of Pre requisites to Business Communicati 2.To put in use the basic mechanics of Grammar.		
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO1: Understand the various forms of the business organizations along with their important features and legal rules CLO2: Students will know the working of the Industries, ethical values and corporate social responsibilities. CLO3: Comprehend different types of communication and how business letters and reports helpful for the systematic operation of the organization.. CLO4 Enhance active listening skills to understand and respond appropriately to verbal communication in a business setting. .		
Credits	Theory	Practical	Total
	2	0	2
Teaching Hours per week	0	2	2
Internal Assessment Marks	0	20	20
End Term Exam Marks	0	30	30
Max. Marks	0	50	50
Examination Time	0 hours	1.5 Hours	1.5 Hours
Part B Contents of the Course			
Learning Objectives: 3 **This course aims to equip students with the knowledge and skills to leverage Microsoft Azure, a leading cloud computing platform.** 4 **Students will gain an understanding of core Azure services, deployment models, and best practices for building and managing cloud solutions.**			
Unit	**Topics**		**Cont Hou**

I	Introduction to Communication: Definition of Communication Process of Communication Aims or Objectives of Communication ➢ Knowledge Information Report Counseling Motivation Request Order Warning Suggestion ➢ Advice Complaint Raising morale Instruction The Seven C's of the Effective Communication 1) Completeness 2) Conciseness 3) Consideration 4) Concreteness 5) Clarity 6) Courtesy 7) Correctness	15
II	. Letter writing techniques Understanding the basics of letter writing(A) Physical appearance Paper Quality Color Size Continuation sheet Typing On conventional type writer On computers (B) Advantages of typing on computer Margin Folding Envelop Sizes Window envelop Superscription Structure of letter and essential parts of letter • Heading Date Reference number Confidential and personal notes In side address Attention line • Salutation Subject Body of the letter Complimentary close Signature Postscript • Enclosures Identification initial • Carbon notation Style or format of the letter • The full block from The semi block form The modified block form Principles of effective letter writing	15
III	Types of letters Inquiry letters Solicited inquiry Un solicited inquiry Routine inquiry Inquiry for a special purpose or favor Reply to inquiry letter Circumstantial reply Order letter Order letter by the buyer Acknowledgement of orders Reply to order letter Execution of orders Cancellation of orders	15
IV	Words of ten misspelled and confused A List of commonly confused and misused words COMMONLY CONFUSED WORDS 1) Accept/Except Advice(Noun)/Advise(Verb) 2) Adverse/Averse Affect(Verb);/Effect(Noun); 3) Aisle/Isle Allude/Elude Allusion/ Illusion False Idea 4) Already/All Ready Altar/Alter Altogether/All Together Angel/Angle Accent/Ascent Assent Consent ,Agreement Beside/Besides Boar/Bore Board /Bored Born/Borne Brake/Break Buy/By Canvas/Canvass Capital/Capitol	15
	Total Contact Hours	
	Suggested Evaluation Methods	
	Internal Assessment: 20	**End Term Examination: 30**
Theory	**20**	**Theory** **30**

Class Participation:	5	Written Examination
Seminar/presentation/assignment/quiz/class test etc.:	5	
Mid-term Exam:	10	

Part C-Learning Resources

Reference Books:

1) **Sehgal , M.K. Khetar pal ,*Nature and scope of Business Communication*, Excel Books: Delhi, 2003. Print.**
2) **Rai,Urmila,S.M.Rai,*BusinessCommunication*,HimalayaPublishingHouse: Delhi, 2002. Print.**

Suggested Readings:

1) **Rao , Babu , *CommunicationToday*,HimalayaPublishingHouse:Delhi,2003. Print.**
2) **Kaul , Asha ,*Effective Business Communication* ,Prentice Hall of India: Delhi, 2005.Prin**

PGDCA 1st year Semester II

PGDCA201 ented Programming with Java

With effect from Session: 2024-25		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	2nd	
Name of the Course	Object Oriented Programming with Java	
Course Code	PGDCA201	
Course Type	*MAJOR*	
Level of the course (As per Annexure I)		
Prerequisite for the course (if any)		
Course Objectives	1. The main objective of subject is to make the clear the fundamentals concept of java programming. 2. After studying this subject, the student will be able to know install process of the software in system as well as he/ she will able to design the application using this technology.	
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes** CLO1: Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs. CLO2: Read and make elementary modifications to Java programs that solve real-world problems. CLO3: Validate input in a Java program. CLO4: Identify and fix defects and common security issues in code. CLO5: Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages. CLO6: Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes	
Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours
Part B Contents of the Course		

Learning Objectives:

1. **The main objective of subject is to make the clear the fundamentals concept of java programming.**
2. **After studying this subject, the student will be able to know install process of the software in system as well as he/ she will able to design the application using this technology.**

Unit	Topics	Contact Hours
I	Introduction to Object-oriented Programming: Basic Concepts: Object-oriented programming (OOP) principles (encapsulation, inheritance, polymorphism, abstraction). Java Basics: Java syntax, data types, variables, operators, control structures. Classes and Objects: Class definition, object creation, constructors, methods, access modifiers.	15
II	Advanced Object-oriented Concepts: Inheritance: Types (single, multilevel, hierarchical), method overriding, super keyword. Polymorphism: Compile time (method overloading), runtime (method overriding), and dynamic method dispatch. Interfaces and Abstract Classes: Definition, implementation, differences, applications.	15
III	Exception Handling and File I/O: Exception Handling: Types of exceptions, try catch block, throw, throws, finally, custom exceptions. File I/O: File handling in Java (File Reader, File Writer, Buffered Reader, and Buffered Writer), serialization and deserialization.	15
IV	Advanced Java Features: Collections Framework: List, Set, and Map interfaces, Array List, Linked List, Hash Set, Tree Set, Hash Map, and Tree Map. Multithreading: Thread lifecycle, creating threads (Thread class, Runnable interface), and synchronization, inter thread communication. GUI Programming: AWT, Swing, event handling, layout managers.	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid Term Exam:	20		

Part C- Learning Resources

Reference Books:

1. **The Complete Reference JAVA, TMH Publication.**
2. **Beginning JAVA, Ivor Horton, WROX Public.**
3. **JAVA 2 UNLEASHED, Tech Media Publications.**
4. **JAVA 2(1.3) API Documentations.**
5. **Any other book(s) covering the contents of the paper in more depth**

PGDCA202-Computer Graphics & Multimedia		
With effect from Session: 2024-25		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	2nd	
Name of the Course	Computer Graphics & Multimedia	
Course Code	PGDCA202	
Course Type	MAJOR	
Level of the course (As per Annexure I)		
Prerequisite for the course (if any)		
Course Objectives	1. Subject will help to understanding the core concepts of Computer Graphics. Student will be able to work on scan conversion, 2D, 3D – transformation and viewing and will be able to create interactive computer Graphics with understanding of shading. 2. This subject also helps to develop software in the Computer Graphics and Multimedia fields of increasing size and complexity across different application areas.	
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes** CO1: Have a basic understanding of the core concepts of computer graphics. CO2: Be capable of using OpenGL to create interactive computer graphics. CO3: Understand a typical graphics pipeline. CO4: Have made pictures with their computer. CO5: Understand the basics of computer graphics, different graphics systems and applications of computer graphics. CO6: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.	
Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours
Part B Contents of the Course		

Learning Objectives: **1. Subject will help to understanding the core concepts of Computer Graphics. Student will be able to work on scan conversion, 2D, 3D – transformation and viewing and will be able to create interactive computer Graphics with understanding of shading.**

2. This subject also helps to develop software in the Computer Graphics and Multimedia fields of increasing size and complexity across different application areas.

Unit	Topics	Contact Hours
I	Introduction to Computer Graphics: Basic Concepts: Graphics systems, applications, graphics hardware, and software. Graphics Primitives: Points, lines, circles, ellipses, polygons, algorithms (DDA, Bresenham's).2D Transformations: Translation, rotation, scaling, reflection, shearing, homogeneous coordinates.	15
II	3D Graphics and Transformations: 3D Concepts: 3D coordinate systems, projections (parallel, perspective).3D Transformations: Translation, rotation, scaling, reflection, shearing, composite transformations. Viewing Pipeline: Viewing coordinates, clipping, and viewport transformation.	15
III	Rendering Techniques: Hidden Surface Removal: Zbuffer, backface culling, painter's algorithm. Lighting and Shading: Light sources, illumination models, shading models (flat, Gouraud, Phong). Texture Mapping: Texture mapping techniques, mipmapping, bump mapping.	15
IV	Multimedia Concepts: Multimedia Basics: Definitions, components (text, images, audio, And video), applications. Audio and Video: Audio formats, video formats, compression techniques (JPEG, MPEG). Multimedia Systems: Multimedia hardware, software, multimedia databases.	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid-term Exam:	20		

Part C-Learning Resources

Reference Books:

1. **Donald Hearn and M.Pauline Baker: Computer Graphics, PHI Publications**
2. **Plastock : Theory & Problem of Computer Graphics, Schaum Series.**
3. **Foley & Van Dam: Fundamentals of Interactive Computer Graphics, AddisonWesley.**
4. **Newman : Principles of Interactive Computer Graphics, McGraw Hill. 5. .Tosijasu, L.K. : Computer Graphics, Springerverleg**
6. **S Gokul: Multimedia Magic, BPB Publication.**
7. **Bufford: Multimedia Systems, Addison Wesley.**
8. **Jeffcoate : Multimedia in Practice, PreticeHall.**
9. **Any other book(s) covering the contents of the paper in more depth.**

PGDCA203-Computer Networks

With effect from Session: 2024-25		
Part A – Introduction		
Name of the Programme	PGDCA	
Semester	2nd	
Name of the Course	Computer Networks	
Course Code	PGDCA203	
Course Type	MAJOR	
Level of the course (As per Annexure I		
Prerequisite for the course (if any)		
Course Objectives	1. Aim of this course is to discuss and explain about basics of data communication and networking concepts. 2. After studying the subject student will be able to understand the working of different type of protocol of networking and model such as OSI reference model, CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing etc.	
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes** CLO1: Recognize and Describe about the working of Computer Networks. CLO2: Illustrate reference models with layers, protocols and interfaces. CLO3: Summarize functionalities of different Layers CLO4: Combine and distinguish functionalities of different Layers. CLO5: Model the LAN and WAN configuration using different media. CO6: Examine problems of a computer networks.	
Credits	Theory	Total
	4	4
Teaching Hours per week	4	4
Internal Assessment Marks	30	30
End Term Exam Marks	70	70
Max. Marks	100	100
Examination Time	3 hours	3 Hours
Part B Contents of the Course		

Learning Objectives:

1. Aim of this course is to discuss and explain about basics of data communication and networking concepts. 2. After studying the subject student will be able to understand the working of different type of protocol of networking and model such as OSI reference model, CSMA/CD, TCP/IP implementation, LANs/WANs, internetworking technologies, Routing and Addressing etc.

Unit	Topics	Contact Hours
I	Introduction to Computer Networks: Basic Concepts: Network types (LAN, WAN, MAN), topologies (bus, star, ring, and mesh), protocols, OSI and TCP/IP models. Physical Layer: Transmission media (wired, wireless), switching techniques (circuit, packet, message). Data Link Layer: Error detection and correction, flow control, MAC protocols (Ethernet, token ring).	15
II	Network Layer: Routing Algorithms: Distance vector, link state, path vector, hierarchical routing.IP Addressing: IPv4, IPv6, subnetting, CIDR, NAT. Network Layer Protocols: ARP, RARP, ICMP, IGMP.	15
III	Transport Layer: Transport Layer Protocols: TCP, UDP, SCTP. Congestion Control: Techniques (leaky bucket, token bucket), TCP congestion control (slow start, congestion avoidance).Quality of Service (QoS): Concepts, techniques (traffic shaping, policing), protocols (RSVP, DiffServ).	15
IV	Application Layer: Application Layer Protocols: HTTP, FTP, SMTP, POP3, IMAP, DNS.Network Security: Cryptography, digital signatures, certificates, SSL/TLS, firewalls.Emerging Trends: IoT, cloud computing, SDN, network virtualization.	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid-term Exam:	20		

Part C-Learning Resources

Reference Books:

1. **A.S. Tanenbaum: Computer Networks (4th ed.), PrenticeHall of India.**
2. **W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.**
3. **P.C. Gupta: Data Communications and Computer Networks, PrenticeHall of India.**
4. **Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.**
5. **L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan Kaufmann.**
6. **William Stallings: Data and Computer Communications, Pearson Education.**

PGDCA204-Theory of Computation			
With effect from Session: 2024-25			
Part A – Introduction			
Name of the Programme	PGDCA		
Semester	2nd		
Name of the Course	Theory of Computation		
Course Code	PGDCA204		
Course Type	MAJOR		
Level of the course (As per AnnexureI)			
Prerequisite for the course (if any)			
Course Objectives	1. This subject is the base of the computer machine and the objective is to clear the concept of students regarding the designing and the working of the machine and computer system. 2. After studying this subject student are able to interpret the function of system as well as able to design new machine for the automation of system.		
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes** CLO1: Model, compare and analyses different computational models using combinatorial methods. CLO2: Apply rigorously formal mathematical methods to prove properties of languages, grammars and automata. CLO3: To solve various problems of applying normal form techniques, push down automata and Turing Machines. CLO4: Identify limitations of some computational models and possible methods of proving them. CLO5: Overview of how the theoretical study in this course is applicable to and engineering application like designing the compilers. CLO6: Demonstrate advanced knowledge of formal computation and its relationship to languages.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	00	30
End Term Exam Marks	70	00	70
Max. Marks	100	00	100
Examination Time	3 hours		3 hours
Part B Contents of the Course			

Learning Objectives:

1. **This subject is the base of the computer machine and the objective is to clear the concept of students regarding the designing and the working of the machine and computer system.**
2. **After studying this subject student are able to interpret the function of system as well as able to design new machine for the automation of system.**

Unit	Topics	Contact Hours
I	Automata Theory: Finite Automata: Deterministic (DFA), nondeterministic (NFA), equivalence, And minimization. Regular Expressions: Definitions, operations, equivalence with finite automata. Pumping Lemma: Applications, proving non regular languages.	15
II	Context Free Grammars and Pushdown Automata: Context Free Grammars (CFGs): Definitions, derivations, parse trees, ambiguity. Pushdown Automata (PDA): Definitions, acceptance by empty stack and final state, equivalence with CFGs.Pumping Lemma for CFLs: Applications, proving non context free languages.	15
III	Turing Machines: Turing Machines (TMs): Definitions, configurations, variations (multitude, nondeterministic), equivalence with other models. Decidability: Decidable languages, undecidable languages, examples (halting problem).Reducibility: Recursive and recursively enumerable languages, reductions, Rice's theorem.	15
IV	Computational Complexity: Complexity Classes: P, NP, NP complete, And NP hard, examples. Time and Space Complexity: Definitions, asymptotic notations, complexity analysis. Approximation Algorithms: Concepts, examples (vertex cover, traveling salesman problem).	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
Theory	**30**	**Theory**	**70**
Class Participation:	5	Written Examination	
Seminar/presentation/assignment/quiz/class test etc.:	5		
Mid-term Exam:	20		

Part C- Learning Resources

Reference Books:

1. **Introduction to automata theory, language & computations Hopcroaft& O.D. Ullman, R.Mothwani, 2001, A.W.**
2. **Theory of Computer Sc. (Automata, Langugaes and computations): K.L.P. Mishra & N.Chandrasekaran, 2000PHI.**
3. **Introduction to formal Languages & Automata Peter LinZ, 2001, Narosa Publ.**
4. **Fundamentals of the Theory of Computation Principles and Practice By Ramond Greenlaw and H.James Hoover, 1998, Harcourt India Pvt. Ltd.**
5. **Elements of theory of Computation by H.R.Lewis &C.H.Papaditriou, 1998,PHI.**

6. **Introduction to languages and the Theory of Computation by John C.Martin 2003, T.M.H.**

Practical3 (Tableau Data Visualization)			
	Part A – Introduction		
Name of the Programme	PGDCA		
Semester	2nd		
Name of the Course	Practical3 (Tableau Data Visualization)		
Course Code	PGDCA205		
Course Type	MINOR		
Level of the course (As per Annexure I			
Prerequisite for the course (if any)			
Course Objectives	This lab course provides hands-on experience with Tableau, powerful data visualization tool. Students will learn to connect to data sources, create visualizations, and design dashboards. The course will also cover advanced topics such as mapping, performance optimization, and sharing. 1. Understand the fundamentals of data visualization and Tableau. 2. Connect to various data sources and prepare data. 3. Create basic and advanced visualizations. 4. Design interactive dashboards and stories. 5. Optimize performance and share visualizations		
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes:** CLO1: Create and customize a variety of interactive visualizations and dashboards in Tableau to effectively represent and explore data insights. CLO2: Prepare and transform data for analysis by applying data cleaning techniques, handling missing values, and integrating multiple data sources. CLO3: Apply advanced analytical techniques in Tableau, such as creating calculated fields, performing trend analysis, and utilizing forecasting tools to derive meaningful conclusions. CLO4: Design and implement interactive dashboards and visual storytelling elements that clearly communicate insights and support data-driven decision-making. CLO5: Develop proficiency in connecting Tableau to different data sources, leveraging Tableau's tools and features for efficient data analysis and visualization.		
Credits	Theory	Practical	Total
		4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70

Max. Marks	0	100	100
Examination Time	hours	4 Hours	4 Hours

Learning Objectives:

1. Understand the fundamentals of data visualization and Tableau.
2. Connect to various data sources and prepare data.
3. Create basic and advanced visualizations.
4. Design interactive dashboards and stories.
5. Optimize performance and share visualizations.

	Part B Contents of the Course	
Week	**Topic**	**Hours**
1	**Introduction to Data Visualization and Tableau**	6
	Overview of data visualization	
	Introduction to Tableau	
	Installation and setup	
	Tableau interface and architecture	
2	**Connecting to Data**	6
	Connecting to various data sources	
	Data preparation and cleaning	
	Data blending and joining	
	Data extraction and live connections	
3	**Basic Visualizations**	6
	Creating basic charts (bar, line, pie)	
	Using marks and shelves	
	Sorting and filtering data	
	Creating calculated fields	
4	**Advanced Visualizations**	6
	Advanced chart types (scatter, bubble, heat map)	
	Dual axis and combination charts	
	Using parameters	
	Customizing tooltips	
5	**Dashboards and Stories**	6
	Creating dashboards	
	Adding interactivity to dashboards	
	Designing effective dashboards	
	Creating stories	
6	**Data Aggregation and Calculations**	6
	Aggregating data	
	Using table calculations	
	Level of detail (LOD) expressions	
	Advanced calculations	
7	**Mapping and Geospatial Analysis**	6
	Creating maps	
	Using geographic data	

	Custom geocoding	
	Spatial joins and calculations	
8	**Performance Optimization**	6
	Optimizing workbook performance	
	Data extract optimization	
	Performance recording and analysis	
	Best practices for performance	
9	**Sharing and Collaboration**	6
	Publishing to Tableau Server and Tableau Online	
	Sharing workbooks and dashboards	
	Embedding visualizations	
	Collaboration features	
10	**Advanced Topics and Project Work**	6
	Advanced analytics (forecasting, clustering)	
	Integration with other tools (e.g., R, Python)	

Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30	**End Term Examination: 70**	
Weekly Lab assignment (40%)	**Theory**	**70**
Midterm Project (20%):	Written Examination	
Final Project (40%)		

Part C-Learning Resources

Reference Books:

1. Data visualization with Tableau Parveen Kumar ,
2. Orielly communicating data with Tableau Ben jones
3. Data Visualization: Introduction to Data Visualization with Python, R and Tableau Robert Collins.

PGDCA206 Practical4(MongoDB)			
Part A – Introduction			
Name of the Programme	PGDCA		
Semester	2nd		
Name of the Course	Practical4(MongoDB)		
Course Code	PGDCA206		
Course Type	MINOR		
Level of the course (As per Annexure I)			
Prerequisite for the course (if any)			
Course Objectives	This lab course provides hands-on experience with MongoDB, a popular NoSQL database. Students will learn to design, implement, and manage MongoDB databases, perform CRUD operations, and optimize database performance. The course will also cover advanced topics such as aggregation, indexing, and replication. 1. Understand the fundamentals of MongoDB and NoSQL databases. 2. Perform CRUD operations using MongoDB. 3. Design and implement MongoDB databases. 4. Optimize MongoDB performance. 5. Implement advanced MongoDB features such as aggregation, indexing, and replication.		
Course Learning Outcomes (CLO) **After completing this course, the learner will be able to:**	**Course Outcomes:** CLO1: Design and Implement MongoDB Schemas: Create and design efficient MongoDB schemas using collections and documents, ensuring optimal data modeling for various applications. CLO2: Perform CRUD Op erations: Apply MongoDB commands to perform Create, Read, Update, and Delete (CRUD) operations on documents within a MongoDB database. CLO3: Utilize Aggregation Framework: Implement MongoDB' aggregation framework to perform complex data queries and transformations, including filtering, grouping, and sorting data. CLO4: Manage and Optimize MongoDB Performance: Employ techniques for indexing, query optimization, and performance tuning to ensure efficient database operations and high performance.		
Credits	Theory	Practical	Total
		4	4
Teaching Hours per week	0	8	8
Internal Assessment Marks	0	30	30
End Term Exam Marks	0	70	70
Max. Marks	0	100	100

Examination Time	hours	4 Hours	4 Hours

Part B Contents of the Course

Learning Objectives:

1. Understand the fundamentals of MongoDB and NoSQL databases.
2. Perform CRUD operations using MongoDB.
3. Design and implement MongoDB databases.
4. Optimize MongoDB performance.
5. Implement advanced MongoDB features such as aggregation, indexing, and replication.

Week	Topic	Hours
1	**Introduction to MongoDB**	6
	Overview of NoSQL databases	
	Introduction to MongoDB	
	Installation and setup	
	MongoDB architecture	
2	**CRUD Operations**	6
	Creating databases and collections	
	Inserting documents	
	Querying documents	
	Updating documents	
	Deleting documents	
3	**Data Modelling**	6
	Schema design	
	Data types and validation	
	Embedding vs. referencing	
	Designing efficient data models	
4	**Indexing**	6
	Introduction to indexing	
	Creating and managing indexes	
	Indexing strategies	
	Performance considerations	
5	**Aggregation Framework**	6
	Introduction to aggregation	
	Aggregation pipeline	
	Common aggregation operations	
	Use cases and examples	
6	**Replication**	6
	Introduction to replication	
	Setting up replica sets	
	Managing replica sets	
	Failover and recovery	
7	**Sharding**	6
	Introduction to sharding	

	Shard keys and sharding strategies	
	Setting up a sharded cluster	
	Managing and monitoring sharded clusters	
8	**Performance Tuning and Optimization**	6
	Query optimization	
	Index optimization	
	Monitoring and profiling	
	Best practices for performance tuning	
9	**Security**	6
	Authentication and authorization	
	Role based access control	
	Data encryption	
	Security best practices	
10	**Advanced Topics and Project Work**	6
	Advanced aggregation techniques	

Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30	**End Term Examination: 70**	
Weekly Lab assignment (40%)	**Theory**	**70**
Midterm Project (20%):	Written Examination	
Final Project (40%)		

Part C-Learning Resources

Reference Books:

1. MongoDB: The Definitive Guide (Paperback) by Kristina Chodorow
2. MongoDB Applied Design Patterns: Practical Use Cases with the Leading NoSQL Database (Paperback), by Rick Copeland