श्री Davara University

Established under Chhattisgarh Private Universities (Establishment and Operation) Act, 2005

MCA

SEMESTER-I

Programme Curriculum

Semester I

S.No	Course Code	Course Title	Teaching Hours Per Week				Examination Scheme				
Theory			L	T	P	C	Theory		Practical		Total Marks
							EX	IN	EX	IN	
1.	MCA101T	Data Structure using C	3	1	0	4	70	30	-	-	100
2.	MCA102	Numerical Methods	3	1	0	4	70	30	-	-	100
3.	MCA103	Computer System Architecture	3	1	0	4	70	30	-	-	100
4.	MCA104	Operating System	3	1	0	4	70	30	-	-	100
Practical											
5.	MCA105P	Data Structure using C	0	0	4	2	-	-	35	15	50
Elective 1											
6.	ELE101	Computer Security	3	1	-	4	70	30	-	-	100
Total Contact Hours Per Week:20		Total Credit:				22	Total Mark				550

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PART-A: Introduction			
Programme: Master of Computer Application	**Semester-I**		**Session: 2024-2028**
Course Code	**MCA101T**		
Course Title	**Data Structures Using C**		
Course Type	**DSC(Discipline Specific Course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** 1. To learn basic Programming Skills 2. To develop algorithms for performing different operations on data structures and implement 3. Processing and compression techniques. 4. Write code for an Algorithm 5. Understand the flow of data and instructions in programming 6. Apply various data structures for problem solving 7. Find employability in software development companies, and startups.		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	Introduction to C language: Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators. Decision and Loop Control Statements, Arrays, Functions, Storage Class, Recursion, Structures and Unions, Pointers, Dynamic Memory Allocation.	15
II	Stacks: Representation & Operations, Applications of Stack: Postfix expression evaluation, Infix to Postfix Conversion. Queue: Representation and Operations, Circular Queue. Linked List. Doubly Linked List, Circularly Linked List, Linked List Operations: Insertion, Deletion, Search, Reverse, Traversal.	15
III	Trees: Preliminaries, Tree: Representation & Implementation. Binary Search Trees: Representation & Operations - Find, Insert, Delete. Binary Tree Traversals. AVL Trees: Single Rotation, Double	15

	Rotation. Introduction to Graph, Graph representation: Adjacency matrix, Adjacency list, Graph Traversals: DFS, BFS.	
IV	Search: Sequential and Binary search, Sorting Algorithms: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Heap Sort, Quick Sort, Counting Sort. Hashing: Hash Functions, Separate Chaining, Open Addressing - Linear Probing, Quadratic Probing.	**15**

PART-C: Learning Resources

Text Books, Reference Books and Others

a. E. Balaguruswamy‖ Programming in C‖, Tata McGraw Hill
b. Brian W. Kernighan , Dennis M. Ritchie, "The C Programming Language (Ansi C Version)",
c. 2nd Edition, PHI
d. H. Schildt, C The Complete Reference‖, Tata McGraw Hill
e. Y. Kanetkar,‖Let us C‖, BPB Publication.
f. Peter van der Linden, "Expert C Programming: Deep C Secrets", Pearson India
g. Mark Allen Weiss, "Data Structure and Algorithm Analysis in C", 2nd Edition, Pearson
h. Education.
i. Samir Kumar Bandyopadhyay, "Data Structures using C", 1st Edition, Pearson Education
j. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with
k. C", 2nd Edition, Cengage Learning
l. 9. Nick Parlante, "Linked List Problems", Stanford University

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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PART-A: Introduction			
Programme: Master of Computer Application		**Semester-I**	**Session: 2024-2028**
Course Code	**MCA102**		
Course Title	**Numerical Methods**		
Course Type	**DSC(Discipline Specific Course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** 1. To learn various numerical techniques. 2. To be able to implement different numerical techniques using programming language. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. 3. Analyse and evaluate the accuracy of common numerical methods. 4. It is widely used for forecasting and predicting in the field of machine learning. Good grip on this subject will enable students employable in machine learning and AI projects.		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	Number System and Errors: Introduction, Binary Number, Octal Numbers, Hexadecimal Number, Floating point representation, Approximation of numbers, Polynomial Interpolations: Existence and Uniqueness of Interpolating polynomial, Lagrange‘s Interpolating Formula, Error in Interpolation, Interpolation points for minimizing the error bound	
II	Newton‘s Divided Difference Interpolating polynomial, Properties of divided Differences, Forward Difference Operator. Newton‘s Forward Difference Interpolating formula, Backward Difference Operator Newton‘s Backward Difference Interpolation formula	
III	Method of bisection, Secant Method & Regular falsie Method, Newton-Raphson Method& convergence, Fixed point of a function, Fixed point iteration method, Some	

	simple Quadrate Rules, Newton-Cotes Rules, Compound quadrate Rules, Gauss legendre-2 & 3 point	
IV	Numerical solution of ordinary differential equation -Euler method, Modification of Euler's method, Runge-Kutta method of order two and four	

PART-C: Learning Resources

Text Books, Reference Books and Others

1. B.P. Acharya & R.N. Das, "A Course On Numerical Analysis", Kalyani Publishers
2. Elementary Numerical Analysis By J.K.Mantri
3. Numerical Analysis By S.S. Sastry.

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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PART-A: Introduction

Programme: Master of Computer Application	Semester-I	Session: 2024-2028

Course Code	**MCA103**	
Course Title	**Computer System Architecture**	
Course Type	**DSC(Discipline Specific Course)**	
Prerequisite	As per program	
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able to** 1. Explain the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines, Machine Instructions 2. Describe various data transfer techniques in digital computer and the I/O interfaces 3. This will help them to design, develop, and implement applications better, faster, cheaper, and more efficient manner, thereby will increase their employability.	
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**
Total Marks	**Max. Marks:100**	**Min marks -40**

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	Structure of Computer Hardware: Basic function units and their Operational concepts, Single Bus Structure. Logic circuits: Logic functions, Synthesis if logic expression, Using AND, OR and NOT gates, Minimization of logic expressions using Karnaugh maps, don_t care conditions, Synthesis using NAND and NOR gates. Computer Arithmetic: Binary Arithmetic, Addition and Subtraction of signed number, Multiplication of positive number. Signed operand multiplication, Division, Floating point number representation and arithmetic	15
II	Basic processing of Instruction: Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Addressing format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed control unit, Design of Control Unit and ALU.	15
III	Memory: Memory Hierarchy, RAM, ROM, Cache memory organization, Mapping techniques, Virtual memory, Mapping technique, Associative memory, Memory Interleaving, Secondary Storage, Flash drives. Design	15
IV	Input/Output: Accessing I/O devices. Programmed I/O. Memory mapped I/O. Interrupt Driven I/O. Standard I/O interfaces. Synchronous and Asynchronous Data Transfer, DMA Data transfer.	15

PART-C: Learning Resources

Text Books, Reference Books and Others

1. M. Morris Mano , "Computer System Architecture", Pearson Education
2. William Stallings, "Computer Organization and Architecture", Pearson Education
3. V. Rajaraman and T. Radhakrishnan, "Computer Organization and Architecture", PHI
4. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, Mc Graw Hill Education
5. A. S. Tanenbaum, "Structured Computer Organization", Pearson Education

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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PART-A: Introduction			
Programme: Master of Computer Application		**Semester-I**	**Session: 2024-2028**
Course Code	**MCA104**		
Course Title	**Operating System**		
Course Type	**DSC(Discipline Specific Course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • To understand overall functionality of Operating System such as Process Management, • Memory Management, File Management and Security Issue. • To Provide sufficient understanding of operating system design • To understand the impact of operating system on application systems design and Performance • Exhibit familiarity with the fundamental concepts of operating systems. • Apply a mature understanding of operating system design and how it impacts application systems design and performance. • Exhibit competence in recognizing operating systems features and issues. • It helps students to become a good programmer. • Operating systems are designed to give programmers a common set of commands to		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	Introduction to Operating Systems. User View & System View of OS. Operating System Concepts, Interrupts & System Calls. Operating System Services. Processes. Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Priority, Round-Robin, Multilevel Queue, Multilevel Feedback Queue).	
II	Inter Process Communication. Process Synchronization: Background, The Critical-Section Problem, Semaphores, Counting Semaphores & Binary Semaphores. The Dining-Philosophers Problem. Monitors	

III	Deadlocks: Basic cause of deadlock, Conditions for deadlock, Resource-Allocation graph. Deadlock Prevention, Deadlock Avoidance with Banker's algorithm. Deadlock Detection.	
IV	Memory Management Strategies: Background (Address Binding, Logical vs Physical Address space), Swapping, Contiguous Memory Allocation: Dynamic Memory Allocation (First-fit, Best-fit, Worst-fit), Fragmentation. Paging, Page Tables. Segmentation. Virtual Memory Management: Background (Virtual Memory & Virtual Address Space). Demand Paging, Page faults, Page replacement techniques: FIFO, Optimal, LRU. Frame allocation techniques, Thrashing.	

PART-C: Learning Resources

Text Books, Reference Books and Others

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, ―Operating System Concepts‖, 8th Edition, Wiley India
2. Harvey M. Deitel, Paul J. Deitel, David R. Choffnes, ―Operating Systems‖, 3rd Edition, Pearson Education
3. William Stallings, ―Operating Systems: Internals and Design Principles‖, 6th Edition, PHI Learning / Pearson Education
4. Andrew S. Tanenbaum, ―Modern Operating Systems‖, 3rd Edition, PHI Learning / Pearson Education

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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PART-A: Introduction			
Programme: Master of Computer Application		**Semester-I**	**Session: 2024-2028**
Course Code	**ELE101**		
Course Title	**Computer Security**		
Course Type	**DSC(Discipline Specific Course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • Describe network security services and mechanisms. • Symmetrical and Asymmetrical cryptography. • Data integrity, Authentication, Digital Signatures. • Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc • Skills like networking and knowledge of operating systems are required to start a cyber security career. Students can get jobs in multinational, government and private organizations.		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense; Elementary Cryptography: Substitution Ciphers, Transpositions, Making "Good" Encryption Algorithms, Private-Key Cryptosystems, The Data Encryption Standard, The AES Encryption Algorithm, Public-Key Cryptosystems, Public Key Encryptions, Uses of Encryption	
II	Program Security : Secure Programs, Non-malicious Program Errors, viruses and other malicious code, Targeted Malicious code, controls Against Program Threats, Protection in General-Purpose operating system protected objects and methods of protection memory and address protection, File protection Mechanisms, User Authentication Designing Trusted O.S : Security policies, models of security, trusted O.S. design, Assurance in trusted OS, Implementation examples.	
III	Database Security: Security requirements, Reliability and integrity, Sensitive data, Inference, multilevel database, proposals for multilevel security Network	

	Security: Threats in Network, Network Security Controls, Firewalls, Intrusion DetectionSystems, Secure E-mail.	
IV	Administering Security: Security Planning, Risk Analysis, Organizational Security policies, Physical Security; The Economics of Cyber security; Privacy in Computing; Legal and Ethical Issues in Computer Security: Protecting Programs and data, Information and the law, Rights of Employees andEmployers, Software failures, Computer Crime.	

PART-C: Learning Resources

Text Books, Reference Books and Others

Charles P. Pfleeger& Shari Lawrence Pfleeger, "Security in Computing", 4th Edition,Pearson Education
2. Josef Pieprzyk, Thomas Hardjono, Jennifer Seberry, "Fundamentals of Computer Security", Springer & Universities Press India
3. Dieter Gollmann, "Computer Security", 2nd Edition, Wiley India
4. William Stallings & Lawrie Brown, "Computer Security: Principles and Practice", 1st Edition, Pearson Education
5. Charlie Kaufman, Radia Perlman & Mike Speciner, "Network Security: Private Communication in a Public World", 2nd Edition, PHI Learning
6. Chuck Easttom, "Computer Security Fundamentals", 1st Edition, Pearson Education

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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PART-A:Introduction

Programme: Master of Computer Application	**Semester-I**	**Session: 2024-2028**

Course Code	**MCA105P**
Course Title	**Data Structure using C Lab**
Course Type	**Practical**
Prerequisite	As per program
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** 1. To learn basic Programming Skills 2. To develop algorithms for performing different operations on data structures and implement 3. Processing and compression techniques. 4. Write code for an Algorithm 5. Understand the flow of data and instructions in programming 6. Apply various data structures for problem solving

Credit Value	**1 Credits**	**Credit-30 Hours – Lab practical's & training**
Total Marks	**Max. Marks:50**	**Min marks -20**

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-45 Periods (45 Hours) No. of Topics (Course contents)

Module	Topics(Course Content)	No. of Period
	1. Creating and editing simple C programs, compilation and execution. 2. Program on Expressions, Operators, Simple Arithmetic, Decision and Loop Control Statements. 3. Program demonstrating Single & Multidimensional arrays. 4. Program demonstrating Functions, recursion. 5. Program demonstrating structure and union. 6. Program demonstrating Pointers and dynamic memory allocation. 7. Program demonstrating Array based Stacks: Postfix expression evaluation, Infix to Postfix Conversion. 8. Program demonstrating Array based Queues: Queue operations, Circular queue.	

	9. Program demonstrating Linked List, Doubly Linked List, Circularly Linked List, Linked List Operations: Insertion, Deletion, Search, Traversal. 10. Implementing Stacks & Queues using Linked List. 11. Program demonstrating Binary Search Trees: Representation & Operations - Find, Insert, Delete. Binary Tree Traversals: inOrder, preOrder, postOrder. 12. Implementation of Binary search. 13. Sorting Implementations: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Heap Sort, Quick Sort, Counting Sort. 14. Simple Hash Table implementation.	

Name and Signature of Convener & Members of CBoS

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books

- Michael T, Goodrich Data Structure and algorithm in C++,Wiley
- Horowitz and Sahani fundamentals of data structure computer Science Press

Reference Books Recommended:

- Alfred v. Aho, Data Structure and Algorithm
- Jean Paul Trembley and Paul Sorenson

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 marks
Continuous Internal Assessment (CIA): 15 Marks.
End Semester Exam (ESE): 35 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:10 & 10 Assignment /seminar-05 Total marks:-15**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 15 marks.**
End Semester Exam (ESE):	**Laboratory/field skill performance: on spot Assessment** **A. Performed the task based on lab work- 20 marks** **B. Spotting based on tools & technology(written)-10marks** **C. Viva-voce(based on principle/technology)- 5 marks**	

Name and Signature of Convener & Members of CBoS.

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MCA

SEMESTER-II

Programme Curriculum

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	TEACHING HOURS PER WEEK				EXAMINATION SCHEME				
							THEORY		PRACTICAL		TOTAL MARKS
DISCIPLINE SPECIFIC COURSE			L	T	P	C	EX	IN	EX	IN	
1.	MCA201T	Programming using Java	3	1	0	4	70	30	-	-	100
2.	MCA202T	DBMS	3	1	0	4	70	30	-	-	100
3.	MCA203	Cloud Computing	3	1	0	4	70	30	-	-	100
4.	MCA204	Automata theory and formal languages	3	1	0	4	70	30	-	-	100
PRACTICAL LAB											
5.	MCA201P	Java Lab	-	-	2	1	-	-	35	15	50
6.	MCA202P	DBMS Lab	-	-	2	1	-	-	35	15	50
Elective 1											
7.	ELE205	Computer Network	3	1	0	4	70	30	-	-	100
Total Credit: 22							Total Marks: 600				

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TWO YEAR POSTGRADUATE PROGRAMME (2024-26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction

Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)	Semester-II	Session: 2024-2026

Course Code	**MCA201T**	
Course Title	**Programming with Java**	
Course Type	**DSC (Discipline specific course)**	
Prerequisite	As per program	
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • Students will be able to write core Java program. • Able to handle runtime error, able to create multithreads. • Students will be able to handle File through JavaAPIs. • Students will obtain skill to network programming by using Java network APIs, TCP/IP Socket and distributed application development using RMI. • Students will be able to create I/O interface using swing APIs and event handling through AWT APIs	
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**
Total Marks	**Max. Marks:100**	**Min marks -40**

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	Overview of Java: Features of Java, Byte-code, JVM, data types, variables and arrays, control statements, Introduction to Java class and object, main() function, garbage collection and finalize() method, this, inheritance, method overriding, dynamic method dispatching, super, final, package, interface, abstract class, class path, String and String Buffer Class.	15
II	Exception Handling and Multithreading: Exception types, uncaught Exception, using try-catch, throw, throws, finally, Throwable class and object, Exception classes, create own exception subclass. Creating multiple threads, isAlive(), join(),Threadpriorities, synchronization, Deadlock, wait(), notify(), notifyAll() methods, inter-thread communication,suspend, resume and stop the threads. Collection framework - HashSet, Array List, HashMap	15
III	Streams and Sockets: I/O classes &Interfaces, File, The Stream Classes, the Byte stream(InputStream, OutputStream, FileInputStream, FileOutputStream), Serialization. Network basics, Networking classes and Interfaces, InetAddress, TCP/IP Client/Server socket, URL, URL Connection, Datagram, Introduction to	15

	RMI.	
IV	Event Handling and Swing: Delegation event model, event classes, Event listener interface, Layout managers, Swing: benefits of Swing over AWT, JFrames, JPanels, JLabels, JButtons, JTabbedPane, JScrollPane, JSplitPane, JOptionPane, JComboBox, JListBox, Textcomponents, JMenu, JToolbar, JDialog, JTable, Databaseconnectivity.	**15**

PART-C: Learning Resources

Text Books, Reference Books and Others

1. The Complete Reference Java 2 (Updated to Cover J2SE 1.4), Herbert Scheldt, Tata McGraw-Hill publishing company Ltd. New Delhi, India.
2. Head First Java, Kathy Sierra, Bert Bates, O'Reilly Media.
3. Java 2 for Professionals Developers, Michael Morgan, SAMS, Techmedia, New Delhi.
4. Thinking in Java, The Definitive Introduction to Object-Oriented Programming in the Language of World-Wide- Web, Bruce Echel, Pearson Education.
5. Core Java 2 Volume-I Fundamentals, CayS. Horstmann Gary Cornell, Pearson Education.
6. Java 2 Developer's Hand Book, Philip Heller and Simon Roberts, BPB Publication, New Delhi.
7. Java Thread Programming, Paul Hyde, SAMS.
8. Java Swing, Loy and Wood, O' reilly.

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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TWO YEAR POSTGRADUATE PROGRAMME (2024-26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
PROGRAMME: Master in Computer Application (Certificate/Diploma/Degree/Honors)		**Semester-II**	**Session: 2024-2026**
Course Code	**MCA201P**		
Course Title	**JAVA Lab**		
Course Type	**Practical**		
Prerequisite	**As per PROGRAMME**		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • Implement Core OOP Principles • Manage Runtime Robustness and Concurrency • Utilize Data Structures and External I/O • Develop Integrated GUI Applications with Databases		
Credit Value	**1 Credits**	**Credit-30 Hours – Lab practical's & training**	
Total Marks	**Max. Marks:50**	**Min marks -20**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-45 Periods (45 Hours) No. of Topics (Course contents)

Module	Topics(Course Content)	No. of Period
List of Practical Experiments	1. Write a program to calculate the average and sum of elements in an array to understand basic data types and loops. 2. Develop a program that uses nested control statements to find and print prime numbers within a specified range. 3. Create a basic Class and Object structure representing a BankCustomer to practice using constructors and the this keyword. 4. Demonstrate Inheritance by creating a Vehicle base class and a Car subclass that uses the super keyword to access parent members. 5. Implement Method Overriding and Dynamic Method Dispatch by creating a generic Shape class with a draw() method overridden by Circle and Triangle. 6. Use the final keyword to create constants, final methods that cannot be overridden, and final classes that cannot be inherited. 7. Design a program using an Abstract Class and an Interface to model a payment system supporting CreditCard and PayPal methods. 8. Compare the String and StringBuffer classes by performing multiple modifications on a sequence of characters to observe performance differences. 9. Write a program that uses try-catch-finally blocks to handle division by zero (ArithmeticException) and array index errors.	**30**

	10. Create a Custom Exception class called InsufficientFundsException that is thrown when a bank withdrawal exceeds the balance. 11. Build a Multithreaded application by extending the Thread class and implementing the Runnable interface simultaneously. 12. Use the join() and isAlive() methods to manage thread execution order and check the status of active background tasks. 13. Implement Thread Synchronization using a synchronized block to prevent data inconsistency when multiple threads access a shared counter. 14. Demonstrate Inter-thread Communication using wait() and notify() to solve a classic producer-consumer scenario. 15. Use the Collection Framework to store unique strings in a HashSet, a list of objects in an ArrayList, and key-value pairs in a HashMap. 16. Perform File I/O operations using FileInputStream and FileOutputStream to copy an image or text file from one directory to another. 17. Write a program for Object Serialization to save the state of a User object into a file and then deserialize it back into memory. 18. Develop a basic TCP/IP Client-Server application where the client sends a "Hello" message and the server responds with a timestamp. 19. Create a Swing GUI using JFrame, JButton, and JLabel that uses the Delegation Event Model to respond to button clicks. 20. Build a Database Connectivity (JDBC) program that connects to a database, inserts a record into a table, and displays the result in a JTable.	

Name and Signature of Convener & Members of CBoS

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Java: The Complete Reference" by Herbert Schildt
- "Effective Java" by Joshua Bloch
- "Core Java Volume I & II" by Cay S. Horstmann
- "Database System Concepts" by Silberschatz, Korth, and Sudarshan
- "SQL Cookbook" by Anthony Molinaro

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 marks
Continuous Internal Assessment (CIA): 15 Marks.
End Semester Exam (ESE): 35 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:10 & 10 Assignment /seminar-05 Total marks: -15**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 15 marks.**
End SemesterExam (ESE):	**Laboratory/field skill performance: on spot Assessment** **A. Performed the task based on lab work- 20 marks** **B. Spotting based on tools & technology(written)-10marks** **C. Viva-voce(based on principle/technology)- 5 marks**	

Name and Signature of Convener & Members of CBoS.

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TWO YEAR UNDERGRADUATE PROGRAMME (2024- 26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
Programme Master of Computer Application (Certificate/Diploma/Degree/Honors)		**Semester-II**	**Session: 2024-2026**
Course Code	**MCA201T**		
Course Title	**Database Management System**		
Course Type	**DSC (Discipline specific course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • Understand concept DBMS and its functionalities. • Understand relationship between tables. • Understand various models of DBMS. • Understand various languages.		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	**Introduction To DBMS** Data, Information and knowledge, concept of DBMS, Advantages of DBMS, data independence, database Administration roles, DBMS architecture, different kinds of DBMS users, importance of data dictionary, contents of data dictionary, types of database languages. Data models: network, hierarchical, relational, Introduction to ODBC concept.	15
II	**E-R Model** Entity - Relationship model as a tool for conceptual design-entities, attributes and relationships. ER diagrams; Concept of keys; Case studies of ER modeling Generalization; specialization and aggregation.	15
III	**Relational Model** Structure to Relational Database, Relational Algebra, and Extended Relational-Algebra Operation, Simple and complex queries using relational algebra, The Domain Relational Calculus, Tuple relational calculus.	15
IV	**Relational Database Design** Pitfalls in Relational Database Design, Decomposition, Functional Dependencies, Normalization: 1NF, 2NF, BCNF, 3NF, 4NF, 5NF. **Structured Query Language:** DDL and DML: Creating Table, Specify Integrity Constraint, Modifying Existing	15

	Table, Dropping Table, Inserting, Deleting and Updating Rows in as Table, Where Clause, Operators, ORDER BY, GROUP Function, SQL Function, JOIN, Set Operation, SQL Sub Queries. Views: What is Views, Create, Drop and Retrieving data from views. Security: - Management of Roles, Changing Password, Granting Roles & Privilege, with drawing privileges.	

PART-C: Learning Resources

Text Books, Reference Books and Others

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, Sixth Edition.(All UNITS except III th)
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition.

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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TWO YEAR UNDERGRADUATE PROGRAMME (2024- 26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
PROGRAMME: Master in Computer Application (Certificate/Diploma/Degree/Honors)	**Semester-II**	**Session: 2024-2026**	
Course Code	**MCA202P**		
Course Title	**DBMS Lab**		
Course Type	**Practical**		
Prerequisite	**As per PROGRAMME**		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • Design Conceptual and Logical Schemas • Construct and Optimize Complex Queries • Implement Data Normalization and Integrity • Manage Database Administration and Connectivity		
Credit Value	**1 Credits**	**Credit-30 Hours – Lab practical's & training**	
Total Marks	**Max. Marks:50**	**Min marks -20**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-30 Periods (30 Hours) No. of Topics (Course contents)

Module	Topics(Course Content)	No. of Period
List of Practical Experiments	1. Write a script to Create a Table for an Employee schema, ensuring you define primary keys and appropriate data types like VARCHAR and INT. 2. Perform a Modify Existing Table operation using the ALTER command to add a new column for Email and change the data type of an existing column. 3. Demonstrate Integrity Constraints by creating a table that utilizes NOT NULL, UNIQUE, and CHECK constraints to ensure data validity. 4. Execute a Drop and Truncate script to show the difference between removing a table's structure versus just its data. 5. Write a series of Insert, Update, and Delete statements to manage records within a Product inventory table. 6. Use the WHERE Clause with logical operators (AND, OR, NOT) to filter specific records from a large dataset. 7. Apply ORDER BY and LIMIT/TOP clauses to sort a list of students by their marks in descending order.	**30**

8. Use Group Functions (Aggregate Functions) like COUNT, SUM, AVG, MIN, and MAX to generate a summary report of departmental salaries.
9. Implement the GROUP BY and HAVING clauses to group employees by department and filter groups that have an average salary above a certain threshold.
10. Perform SQL Joins (Inner, Left, Right, and Full) to combine data from Orders and Customers tables based on a common ID.
11. Execute Set Operations using UNION, INTERSECT, and EXCEPT to compare data between two different branches of a library database.
12. Write a Nested Subquery to find employees who earn more than the average salary of the entire company.
13. Design an Entity-Relationship (ER) Diagram for a Hospital Management System, identifying entities, attributes, and relationship cardinalities.
14. Demonstrate Generalization and Specialization by designing a high-level Account entity that branches into Savings and Current accounts.
15. Perform Normalization up to 3NF by taking a flat, redundant table and decomposing it into multiple tables to eliminate update anomalies.
16. Identify Functional Dependencies within a dataset and determine the highest Normal Form (1NF, 2NF, 3NF, or BCNF) the table currently satisfies.
17. Create and manage Views to provide a restricted window of data to specific users while hiding sensitive underlying table structures.
18. Implement Database Security commands using GRANT and REVOKE to manage user privileges and roles for a specific database schema.
19. Configure an ODBC Connection string to link a front-end application (like Java) to your SQL database to test basic data retrieval.

Name and Signature of Convener & Members of CBoS

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
- "Fundamentals of Database Systems" by Ramez Elmasri and Shamkant B. Navathe
- "SQL Cookbook: Query Solutions and Techniques for Database Developers" by Anthony Molinaro
- "Learning SQL" by Alan Beaulieu

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 marks
Continuous Internal Assessment (CIA): 15 Marks.
End Semester Exam (ESE): 35 marks

Continuous Internal Assessment (CIA):	**Internal test/Quiz-:10 & 10 Assignment /seminar-05**	**Better marks out of the two test/Quiz+ obtained marks in**

(By Course Teacher)	**Total marks: -15**	**assignment shall be considered against 15 marks.**
End Semester Exam (ESE):	**Laboratory/field skill performance: on spot Assessment** **D. Performed the task based on lab work- 20 marks** **E. Spotting based on tools & technology(written)-10marks** **F. Viva-voce(based on principle/technology)- 5 marks**	
Name and Signature of Convener & Members of CBoS.		

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TWO YEAR POSTGRADUATE PROGRAMME (2024-26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)	**Semester-II**	**Session: 2024-2026**	
Course Code	**MCA203**		
Course Title	**Cloud Computing**		
Course Type	**DSC (Discipline specific course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • The students will be able to understand concepts relating to cloud computing, such as need, characteristics, uses. • This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domains from a while now. • It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics (Course Content)	No. of Period
I	**Introduction**: Cloud Computing: Vision, Definition, Reference Model, Characteristics, Benefits and Challenges, Historical Developments, Cloud Computing Environments, Cloud Platforms and Technologies; The Evolution of Cloud Computing: Parallel Computing vs. Distributed Computing, Elements of Parallel Computing, Elements of Distributed Computing, Technologies for Distributed Computing, Introduction of Grid Computing.	15
II	**Cloud Computing Architecture**: Service Oriented Architecture, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Data Storage as a Service (DSaaS). Types of Clouds; Economics of the Cloud and Open Challenges; Security and Organizational aspects: Host Security and Data Security.	15
III	**Virtualization**: Introduction, Characteristics, Taxonomy of Virtualization, Levels of Virtualization, Structure and Mechanism of Virtualization, Virtualization and Cloud Computing, Advantages and Disadvantages, Virtualization Technology Examples: Xen, VMware, Microsoft Hyper-V.	15
IV	**Industry Platforms**: Amazon Web Services, Google AppEngine, Microsoft Azure; Cloud Applications: Scientific Applications, Business and Consumer Applications; Advanced Topics: Energy Efficiency in Clouds, Market Based Management,	15

	Federated Clouds/InterCloud, Third Party Cloud Services.	

PART-C: Learning Resources

Text Books, Reference Books and Others

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008
3. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
4. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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TWO YEAR POSTGRADUATE PROGRAMME (2024-26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)		**Semester-II**	**Session: 2024-2026**
Course Code	**MCA204**		
Course Title	**Automata theory and formal languages**		
Course Type	**DSC (Discipline specific course)**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • To use basic concepts of formal languages of finite automata techniques • To Design Finite Automata for different Regular Expressions and Languages • To Construct context free grammar for various languages • To solve various problems of applying normal form techniques, push down automata and Turing Machines		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics(Course Content)	No. of Period
I	FINITE AUTOMATA (FA): Introduction, Deterministic Finite Automata (DFA) - Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA)- Definition of NFA, language of an NFA, Equivalence of Deterministic and Nondeterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.	15
II	REGULAR EXPRESSIONS (RE): Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions. REGULAR GRAMMARS: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular - Pumping lemma, applications, Closure properties of regular languages.	15
III	CONTEXT FREE GRAMMER (CFG): Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization	15

	of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL (Proof's omitted).	
IV	PUSHDOWN AUTOMATA: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. TURING MACHINES (TM): Formal definition and behaviour, Languages of a TM, TM as accepters, Department of Computer Science and Engineering MLR Institute of Technology- UG - Autonomous-Regulations & Syllabus – MLR - 17 Page | 68 and TM as a computer of integer functions, Types of TMs	**15**

PART-C: Learning Resources

Text Books, Reference Books and Others

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages andComputation, 3rdedition, Pearson Education, India.
2. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	

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TWO YEAR POSTGRADUATE PROGRAMME (2024-26)
DEPARTMENT OF COMPUTER APPLICATION
COURSE CURRICULUM

PART-A: Introduction			
Programme: Master of Computer Application (Certificate/Diploma/Degree/Honors)		**Semester-II**	**Session: 2024-2026**
Course Code	**ELE205**		
Course Title	**Computer Network**		
Course Type	**Elective Course**		
Prerequisite	As per program		
Course Learning Outcomes (CLO)	**At the end of this course, the students will be able** • The students will be able to understand the structure and organization of computer networks; including the division into layers, role of each layer, and relationships between the layers. • The students will have basic understanding of Communication techniques and functioning of physical layer. • The students will be able to understand the basic concepts of data-link layer properties; including the flow control mechanisms. • The students will be able to understand the basic concepts of application layer protocol design • The students will be able to understand the basic concepts of network security concepts including authentication, integrity and system security		
Credit Value	**4 Credits**	**Credit-15 Hours - Learning & Observation**	
Total Marks	**Max. Marks:100**	**Min marks -40**	

PART -B: Content of the Course

Total No. of Teaching-Learning Periods (01 Hr. per period)-60 Periods (60 Hours) No. of Topics (Course contents)

Unit	Topics (Course Content)	No. of Period
I	**Introduction:** Layered Network Architecture, ISO- OSI Model, Introduction to TCP/IP Model.; Data Communication Techniques: Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM).; Multiplexing Techniques: Frequency Division, Time Division, Statistical Time Division Multiplexing; Transmission Media: Wires, Cables, Radio Links, Satellite Link, Fiber Optic.	15
II	**Data Link Layer Protocols**: Noise Free Channels Protocol: Stop and Wait Protocols, Sliding Window	15

	Protocol, Noisy Channels Protocols: Stop and Wait ARQ, Sliding Window ARQ: Go Back and Selective Repeat ARQS, ISDN, Asynchronous Transfer Mode (ATM), ATM cells, Header and Cell Formats, Error Detection And Correction: Single and Burst Error, Parity Check Codes, Cyclic Redundancy Code & Hamming Code. **Medium Access Control Sub Layer:** Concept of Random Access, Pure ALOHA, Throughput characteristics of ALOHA, Throughputs for finite and infinite populations, S-ALOHA, LAN: IEEE 802.3, 802.4 and 802.5 Protocols, Performance of Ethernet, Token Ring Protocol, FDDI Protocol, Distributed Queue Dual Bus (DQDB) Protocol.	
III	**Network and Transport Layer Protocols:** General Principles, Virtual Circuits and Data-grams, Windows Flow Control, Packet Discarding, Traffic Shaping, Choke RSVP, Network Devices: Bridges, Routers and Gateways, Routing Algorithms**:** Optimality principle, Shortest Path Routing- Dijkstra, Distance Vector Routing, Link State Routing, Flow Based Routing, Multicasting Routing, Flooding and Broadcasting, Flow and Congestion Control, Internet Architecture and Addressing, Transport Layer: Design Issues, Quality of Services, Primitives, Connection Management: Addressing, Connection Establishment and Releases, Flow Control and Buffering, Crash Recovery, Protocols: Transmission Control Protocol (TCP), User Datagram Protocol UDP).	**15**
IV	**Application Layer Protocols and Other Networks**: Cryptography: Substitution and Transposition, Ciphers, Data Encryption Standard (DES), DES Chaining, Breaking DES, Public key Cryptography, Authentication Protocols, Virtual LAN (VLAN),Virtual Private Network (VPN).	**15**

PART-C: Learning Resources

Text Books, Reference Books and Others

1. D. Berekas and R. Gallager, "Data Networks", second Ed. Prentice Hall, India
2. D. E. Coner, "Internetworking with TCP/IP", Vol-I. Prentice Hall India.
3. G. E. Keiser," Local Area Networks", McGrawHill, International Ed.
4. W. Stalling, "Data & Computer Communications

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100 marks
Continuous Internal Assessment (CIA): 30 Marks.
End Semester Exam (ESE): 70 marks

Continuous Internal Assessment (CIA): (By Course Teacher)	**Internal test/Quiz-:20 & 20 Assignment /seminar-10 Total marks:-30**	**Better marks out of the two test/Quiz+ obtained marks in assignment shall be considered against 30 marks.**
End Semester Exam (ESE):	**Two section- A&B** **Section A:Q1. Objective-10 marks: Q2. Short answer type-5x4=20 marks** **Section B: Descriptive answer type questions, 1 out of 2 from each unit-4x10=40 marks**	