



**ARUNACHAL
UNIVERSITY**
OF STUDIES

State Education & Skill Self-Sponsored University

**CENTRE FOR DISTANCE &
ONLINE EDUCATION**

**PROGRAMME PROJECT REPORT
MASTER OF COMPUTER APPLICATION**

**CENTRE FOR DISTANCE & ONLINE
EDUCATION {CDOE}**

Programme Name	:-	Master of Computer Application
Eligibility	:-	10+2 or equivalent
Minimum Duration	:-	3 years (6 Semesters)
Maximum Duration	:-	5 years

Programme's Mission and Objective:

The broad objective of the MCA programme is to prepare post graduates for productive careers in software industry, corporate sector, Govt. organizations and academia by providing skill based environment for teaching and research in the core and emerging areas of the discipline. The programme emphasizes the application of software technology to solve mathematical, computing, communications/networking and commercial problems.

Impart knowledge required for planning, designing and building complex Application Software Systems as well as provide support to automated systems or application. Produce entrepreneurs who can develop customized solutions for small to large Enterprises.

Relevance of the Programme with HEI Mission and Goals:

In Arunachal Pradesh, the youth looks forward to shape-up their career in Information Technology or any IT-based services sector. Master of Computer Application Technology can help young students learn, acquire computer skills that enhance their performance in this digital age. The impact of IT and computer science in everyday life from health to communication has only made the world a better, faster and more connected place to live. In order to enhance the brilliant minds of the students to contribute more, the need of local students it is very important to launch this programme

Nature of Prospective Target Group of Learners:

The curriculum of the programme is designed after understanding the diverse needs of the students of the Arunachal Pradesh. We are in the midst of a technological transition and it is up to us to decide how it will influence our world and shape it. The literacy rate of the state is below the average literacy rate of India. This programme will enable the students to be self-dependent and participate in the development of the state and the country through the computer application degree.

Appropriateness of the Programme:

MCA graduates are able to develop and prepare documents, projects, presentations, design websites and demonstrate skills in running software programs. Besides imparting theoretical knowledge, a lot of stress is laid on hands-on training and overall development of the personality. Students graduating from this program can work gainfully in software services companies, outsourcing companies, and other allied sectors. The program has been designed to impart advanced knowledge in various areas of computer applications. It has been designed in such a way that student can complete it based on their advanced coursework. The structure of this program fosters a highly varied learning orientation in students by balancing core courses, advanced elective courses, and a substantial dissertation or project.

Outcome of the Programme:

On completion of MCA degree, the graduates will be able to: Apply the knowledge of mathematics and computing fundamentals to various real life applications for any given requirement. Design and develop applications to analyse and solve all computer science related problems.

Instructional Design:

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|--|----------------------------------|
| 1. Title of the Programme | : Master of Computer Application |
| 2. Minimum Duration of the Programme | : 3 Years {6 Semester} |
| 3. Maximum Duration of the Programme | : 5 Years |
| 4. Weather Listed in Section (22) of UGC Act | : Yes |
| 5. Level of the Programme | : UG-I to UG-III |
| 6. Eligibility | : 10+2/ 10+3 (Any Stream) or eq. |
| 7. Optional Early Exit Certification | : Not Applicable |
| 8. Credit Transfer | : Applicable |

8.1 To the Second Year of Programme: For the Candidates who has successfully completed First Year of Programme from a recognized University/ Institution or any other Institution recognized by the Arunachal University of Studies. A student admitted under this system requires submitting fees for Second Year of the Programme along with Credit Transfer fees as prescribed by the University from time to time.

8.2 To the Third Year of Programme: For the Candidates who has successfully completed First & Second Years of Programme from a recognized University/ Institution or any other Institution recognized by the Arunachal University of Studies. A student admitted under this system requires submitting fees for Third Year of the Programme along with Credit Transfer fees as prescribed by the University from time to time.

8.3 The cases where exact title of Programme is different from the aforementioned Programme Title and more than 75% credits earned in previous qualification matches with the Programme Credits then such Credit Transfers are permitted by the Arunachal University of Studies as per 8.1 and 8.2.

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| 9. Skill Based Credit Transfer | : Applicable |
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9.1 A Candidate who has successfully completed minimum two years of work experience in relevant field or have completed minimum of two year professional certification from an institution after prescribed qualification for the admission into programme are eligible for Skill Based Credit Transfer. The Skill Based Credit Transfer candidates have to appear in all theory examinations in order to earn minimum Two Years credits of the Programme.

9.2 To the Second Year of Programme: Such Candidates are required to earn mismatched theory, practical and industrial credits of First Year along with Second Year Examinations. A student admitted under this system requires submitting fees for First and Second Year of the Programme along with Skill Based Credit Transfer fees as prescribed by the Arunachal University of Studies from time to time.

9.3 To the Third Year of Programme: Such Candidates are required to earn mismatched theory, practical and industrial credits of Second Year along with Third Year Examinations. A student admitted under this system requires submitting fees for Second and Third Year of the Programme along with Skill Based Credit Transfer fees and Lateral Entry Fees/ Credit Transfer Fees (whichever applicable) as prescribed by the Arunachal University of Studies from time to time.

10. Lateral Entry : Not Applicable

11. Division:

The University will award the Divisions to successful candidates in accordance with Section 22 of Rules and Regulations made under the Arunachal University of Studies Act (No. 9 of 2012).

12. Grading Scale:

The Grading Scale of the University will be in accordance with Section 23 of Rules and Regulations made under the Arunachal University of Studies Act (No. 9 of 2012).

13. Programme Credit Distribution:

The Credit System and Programme Credit Distribution of the University will be in accordance with Section 45 and Section 46 of the First Statutes made under the Arunachal University of Studies Act (No. 9 of 2012).

14. Abbreviations and Formulae for Performance Acknowledgement:

Abbreviations and Formulae for Performance Acknowledgement of the University will be in accordance with Section 25 of the Rules and Regulations made under the Arunachal University of Studies Act (No. 9 of 2012).

15. Admission Procedure:

15.1 Admission in Master of Computer Application Annual/ Semester programme of study shall be made on Merit.

15.2 Admission cannot, however, be claimed by any candidate as a matter of right. The admission or re-admission of a candidate shall be entirely at the discretion of the University which may refuse to admit any student without assigning any reason there for.

15.3 On selection for admission to the programme, the candidate shall, within the time fixed by the Dean/ Director deposit the fees prescribed for the programme. If the candidate fails to deposit fees within the stipulated time, the selection shall automatically stand cancelled. Such a candidate shall not be admitted to the concerned programme unless a fresh order of selection and extension of date for payment of fees is issued.

15.4 The candidates other than the domicile of Arunachal Pradesh are required to fulfill the entry criteria as prescribed by the Government of Arunachal Pradesh time to time.

15.5 The Foreign Nationals are eligible for the Programme. Applications of foreign nationals nominated by the Government of India under scholarship schemes and self-financing Foreign Nationals shall be entertained for the aforesaid programme. The Foreign Nationals

are required to obtain Restricted Permit from the Government of Arunachal Pradesh in addition to other papers required by Govt. of India before coming to Arunachal Pradesh.

16. Attendance:

16.1 Attendance of a newly admitted candidate shall be counted from the date of his/her admission, or date of beginning of classes whichever is later, while in the case of promoted candidates, attendance shall be counted from the date on which respective class begins. However, in case of promotion after declaration of results of supplementary examination (if any), the attendance will be counted from the date of admission in the respective case.

16.2 There shall be an Attendance Monitoring Committee in the Faculty under the Chairmanship of the Dean/ Director.

16.3 The Condonation upto 25% can be considered for the following specific cogent reasons:

- Participation in NCC/NSC/NSS Camps duly supported by certificate.
- Participation in University or College Team Games or Interstate or Inter-University tournaments, duly supported by certificate.
- Participation in Educational Excursions, which form a part of teaching in any subject conducted on working days duly certified by the Dean/ Director.
- University Deputation for Youth Festival duly certified by the Dean/ Director.
- Prolonged illness duly certified by the Medical Officer or any other Registered Medical Practitioner, provided such certificate is submitted to the Dean/ Director.

16.4 Minimum attendance criteria will be decided by Dean/ Director of Concerned Faculty from time to time.

16.5 There shall be no attendance criteria for External Candidates.

17. Programme Fee:

Programme Fee will be displayed on official website of the University from time to time.

18. Examination and Result:

18.1 The Distribution of Continuous Internal Assessment and Term End Examination of the programme will be in accordance with Section 24 of the Rules and Regulations made under the Arunachal University of Studies Act (No. 9 of 2012).

18.2 Result will be displayed on the official website of the University. The Statement of Grades will be issued by the Controller of Examination.

18.3 Students can apply for Re-Totalling/ Re-Evaluation on demand as per the procedure in practice from time to time.

18.4 Students designated in Grade F or the students desirous of improving their grades can apply for the same through Backlog/ Improvement examination as per the procedure in practice from time to time.



19. Programme Contents: -

The Total Marks includes Continuous Internal Assessment and End Term Examination. The bifurcation of Continuous Internal Assessment and End Term Examination marks will be in accordance with Section 24 of the Rules and Regulations made under the Arunachal University of Studies Act, 2012 (9 of 2012).

First Semester		
Sr. No.	Name of Subject	Credits
1	Fundamental of Computer & C Language	4
2	Basic of Internet	3
3	Paradigms of Programming	4
4	Computer Organization	4
5	Principle of Management	4
6	System Analysis & Design	3
Total		22

Second Semester		
Sr. No.	Name of Subject	Credits
1	Data Structure	5
2	Object-Oriented Programming Using C++	5
3	Operating System	5
4	Database Management System	4
5	Minor Project Work	3
Total		22

Third Semester		
Sr. No.	Name of Subject	Credits
1	Computer Networks	3
2	Unix and Shell Programming	4
3	Software Engineering	4
4	Management Information System	4
5	Programming in Java	4
6	Analysis & Design of Algorithms	3
Total		22

Fourth Semester		
Sr. No.	Name of Subject	Credits
1	Computer Graphics	5
2	Computer Architecture	5
3	Internet & E-Commerce	4
4	Discrete Mathematics	4
5	Project Work	4
Total		22



Fifth Semester		
Sr. No.	Name of Subject	Credits
1	Advance Database Management System	5
2	Computer Based Numerical & Statistical Techniques	5
3	.NET with C#	6
4	Multimedia Technology	6
Total		22

Sixth Semester		
Sr. No.	Name of Subject	Credits
1	Mobile Technology	5
2	Distributed System	5
3	Cryptography & Network Security	5
4	Project Work & Viva	7
Total		22

Total No. of Credits of Programme: - 132

20. Detailed syllabus: -

Semester I & II

First Semester		
Sr. No.	Name of Subject	Credits
1	Fundamental of Computer & C Language	4
2	Basic of Internet	3
3	Paradigms of Programming	4
4	Computer Organization	4
5	Principle of Management	4
6	System Analysis & Design	3
Total		22

Second Semester		
Sr. No.	Name of Subject	Credits
1	Data Structure	5
2	Object-Oriented Programming Using C++	5
3	Operating System	5
4	Database Management System	4
5	Minor Project Work	3
Total		22

Subject Name: FUNDAMENTAL OF COMPUTER & C LANGUAGE

Unit-I

- 1. Introduction to computer system:** Introduction, Characteristics of computer, Drawbacks of computers, Generations of Computers
- 2. Computer Organization:** Architecture of Computer System
- 3. Number System:** Introduction, Commonly Used Number System, Decimal, Binary, Octal, Hexadecimal, Converting from one number system to another
- 4. Binary Arithmetic:** Introduction, Binary Addition, Subtraction, Multiplication, Division, Representations of characters, BCD Code, EBCDIC, ASCII, Fixed Point Representation, Floating Point Representation
- 5. Algorithms and Flowchart:** Algorithms, Characteristics of algorithms, Flowchart, Different Symbols used in Flowcharts.
- 6. Computer Languages:** Machine Language, Advantages of Machine Language, Disadvantages of Machine Language, High Level Language, Assembly Language, Software, Type of Software, System Software, Application Software
- 7. Input-output Devices:** Introduction, Offline Input Devices, Online Input Devices, Punched Cards, Keyboards, Mouse, Touch Pad, Light Pen, Scanner
- 8. Storage Devices:** Introduction, Primary Memory, RAM, DRAM, ROM, PROM, EPROM, Cache Memory, Secondary Memory, Magnetic Tape, floppy, Hard Disk, CD-ROM
- 9. Operating System:** Introduction, Type of Operating System, Batch Processing Operating System, Single-user Operating System, Multi-User Operating System, Multi-Processing Operating System, Real Time Operating System, DOS, Functions of DOS
- 10. Viruses:** Introduction, Types of Viruses, Antivirus

Unit-II

- 1. An introduction to C:** History of C, Feature of C, Structure of a C program, Variables and Data Types, Arithmetic Expressions
- 2. Components of C Language:** Character Set, C token, Data Type in C, Operators, Type Casting, Data Conversion
- 3. Input / Output Functions:** Formatted Input / Output functions, The print function, The scanf Function, Unformatted Input / Output Function, Character Input / Output Function, String Input / Output Functions
- 4. Conditional Statement:** Introduction, If-else statement, Nesting If-else Statement, The switch Statement
- 5. Looping:** Introduction, While Loop, Do While Loop, Nesting Loop, The Break Statement, The Continous Statement
- 6. Arrays in C:** Array, Two Dimensional Arrays, Passing Array as Parameters, String, Some Library Function for String Handling

7. **Function:** Modular Programming, Top-Down Approach, Structured Programming, function with no Argument and no Return Value, Function Prototype, Storage class in C, Declaring Variables of Specified Storage Classes, Local and Global Variables.
8. **Pointer in C:** Pointer, Passing Pointers as Parameters, Dynamic Memory Allocation, Pointer to Pointer, Pointer to Function.
9. **Structure and Union:** Structure, Array of Structure, Pointer to Structure, Nested Structure, Structure and Function, Difference between Structure and Union.
10. **File Handling in C:** Introduction, Difference between Text and Binary File, Basic File Handling Functions, File Input / Output.
11. **Preprocessor:** Introduction, Functions of a C Preprocessor.

Subject Name: BASICS OF INTERNET

Unit-I

Internet Technology

1. **Evolution & Protocols:** Internet Evolution, Protocols, Interface Concept, Internet V.s. Internet growth of internet ISP, Connectivity - dial up, leased line, VSAT etc. URLs. Domain names, Portals, Application E-mail File Transfer Protocol, Telnet, Chatting, Data Transmission Protocol, Client/Server, architecture and its characteristics, FTP and its Usages. Telnet Concepts, remote logging, protocols, terminal emulation, message board, Internet Chatting, Voice chat, Text chat.
2. **Web Concept:** World Wide Web, Web Publishing, HTML, Design tools, HTML edition, Image edition, Issue in website creation & maintenance FTP s/w for uploading Use of frames and forms in web pages.

Unit-II

E-Commerce

Introduction to E-Commerce: Introduction, Concept technology in E-Commerce, Internet business, Advantage of E-Commerce, Application, Feasibility and constrain.

Subject Name: PARADIGMS OF PROGRAMMING

1. Algorithm.
2. Growth of Function.
3. Analyzing Algorithm Control Structure.
4. Recurrences.
5. Quick Sort.
6. Curriculum of Social Studies.
7. Amortized Analysis.
8. Heap.
9. Sorting in Linear Time.
10. Median and Order Statistics.
11. Backtracking.

Subject Name: COMPUTER ORGANIZATION

Unit-I

The Von Neumann Architecture & ALU Organization

1. Details of Von Neumann Architecture
2. Simple ALU Organization, Arithmetic Processor.

Unit-II

Control Unit & Memory Organization

1. **Control Unit :** Hardwired and Micro programmed Control
2. **Memory Organization:** Primary Memory, Secondary Memory, High Speed memory, Virtual Memory.

Unit-III

I/O Transfer, Peripherals & Assembly language Programming

1. **I/O Transfer :** Program Controlled, interrupt Controlled and DMA
2. **Peripherals & Assembly Language:** Introduction to Computer buses, Peripherals, performance bench marking and current trends in architecture / Assembly language programming.

Subject Name: PRINCIPLE OF MANAGEMENT

1. **Definitions of Management:** Its Nature and Purpose, Management as a Science and art, the Elements of Science, Patterns of Management Analysis-Systems Approach to Operational Management. Function of Managers. Management and Society - Social Responsibility and Ethics with Reference to India and EN India. Operating in a pluralistic Society, Social Responsibility of Managers, ethics in Managing. A Broad Overview of the Different Forms of Business Enterprises in India.
2. **Nature and Purpose of Planning:** Types of Plans; Steps in Planning Process - A Rational Approach to Goal Achievement. Objectives - The Nature of Objectives, Evolving Concepts in Management by Objectives (MBO), the Process of MBO, Setting Objective, Benefits and Weakness of MBO. The Nature and Purpose of strategies Planning Process , The TOWS Matrix, The Portfolio Matrix , Major Kinds of Strategies and policies, The Three Generic Competitive Strategies by Porter, Effective Implementation of Strategies , Premising and forecasting. Decision Making - The Importance and Limitations of Rational Decision Making, Evaluation of Alternatives, Selecting a Alternative, Programmed and Non-Programmed Decision , Decision Making Under Certainty , Uncertainty and risk, Modern Approaches to Decision Making under Uncertainty, Evaluating the Important for a Decision , Other Actor in Decision Making, Decision Support System , Systems Approach and Decision Making.
3. **Nature and Purpose of Organizing:** Formal and Informal Organization, Organizational Division - The Department, Organization Levels and the span of management, factors

Determining an Effective span, organization Environment for Entrepreneur and Entrepreneur, The Structure and process of Reorganizing.

Department by Simple Members, By time, by Enterprise function, by Territory or Geography , by Customer ,By Process or Equipment, and by Product. Matrix Organization, Strategic Business Units, Choosing the Pattern of Departmentation. Authority and Power, Line and staff concepts, Functional Authority, Benefits and Limitations of staff, Decentralization and Delegation of Authority, art of Delegation, Balance as a key to Decentralization.

Unit-II

Functional Methodology

- 1. Human Resource Management and Selection :** Definition of Staffing, Defining the managerial job, Systems Approach to HRM- an Overview the Staffing function, Situational Factors Affecting Staffing , Selecting - Matching the Person with the job, Systems Approach, Position Requirements and job Design, Skills and Personal Characteristics Required by Managers, matching Qualifications with position Requirements, Selection-Process, Techniques and Instruments, Orienting and Socializing New Employees. Performance Appraisal -- Purposes and user of appraisal, Problem of Management Appraisal choosing The Appraisal Criteria, Traditional Trait Appraisals, Apprising Managers against Verifiable Objectives, Appraising Managers As Managers, Rewards and Stress of Managing, Formulating the Career Strategy. Manager Development Process and Training, Approaches to Managers Development, On - The- Job training and internal and external Training, Managing Changes, Organizational Conflict, Organizational Development.
- 2. Controlling The Basis Control Process:** Critical Control points and Standards, Control as a Feedback System, real-time Information and control Feed Forward Control, requirements for Effective Controls. Budget- Traditional non-budgetary Control Devices, Time-even Network analysis, information technology, use of Computers in handling information, Challenges created by information technology. Control of Overall Performance, budget Summaries and report, Profit and loss Control, Control through return on investment, Direct Control v/s Preventive Control, Developing Excellent Mangers.

Subject Name: SYSTEM ANALYSIS & DESIGN

- 1. Data and Information:** Types of information: operational, tactical, strategic and statutory – why do we need. Information systems – management structure – requirements of information at different levels of management – functional allocation of management – requirements of information for various functions – qualities of information – small case study.
- 2. Systems Analysis and Design Life Cycle:** Requirements determination – requirements specifications – feasibility analysis – final specifications – hardware and software study – system design – system implementation – system evaluation – system modification. Role of systems analyst – attributes of a systems analyst – tools used in system analysis.

- 3. Information Gathering:** Strategies – methods – case study – documenting study – system requirements specification – from narratives of requirements to classification of requirements as strategic, tactical, operational and statutory. Example case study.
- 4. Feasibility Analysis:** Deciding project goals – examining alternative solutions – cost – benefit analysis – quantifications of costs and benefits – payback period – system proposal preparation for managements – parts and documentation of a proposal – tools for prototype creation
- 5. Tools for Systems Analysts:** Data flow diagrams – case study for use of DFD, good conventions – leveling of DFDs – leveling rules – logical and physical DFDs – software tools to create DFDs.
- 6. Structured Systems Analysis and Design:** Procedure specifications in structured English – examples and cases – decision tables for complex logical specifications – specification oriented design vs procedure oriented design.
- 7. Data Oriented Systems Design:** Entity relationship model – E-R diagrams – relationships cardinality and participation – normalizing relations – various normal forms and their need – some examples of relational data base design.
- 8. Data Input Methods:** Coding techniques – requirements of coding schemes – error detection of codes – validating input data – input data controls interactive data input.
- 9. Designing Outputs:** Output devices – designing output reports – screen design – graphical user interfaces – interactive I/O on terminals.
- 10. Object Oriented Systems Modeling:** What are objects? – Why objects? – Objects and their properties – classes – inheritance – polymorphism – how to identify objects in an application – how to model systems using objects – some cases of object oriented system modeling.
- 11. Control – Audit and Security of Information Systems:** Audit and security of information systems – why controls are needed – objectives of control – techniques used in control – auditing information systems – auditing around, through and with the computer – testing information systems – types of tests – how to generate tests – security of information systems – disaster recovery – business process continuity.
- 12. Systems Analysis and Design in the Era of Electronic Commerce:** B2B, B2C and C2C e-commerce – advantages and disadvantages of e-commerce. Ecommerce system architecture – physical networks, logical network, World Wide Web, web-services – html, XML.
- 13. Electronic data interchange:** EDI standards – virtual private networks – XML and EDI.
- 14. Security of E-Commerce Transactions, Firewalls:** Encryption methods – symmetric and asymmetric encryption – digital signature – certifying authorities for signatures – legal status of e-commerce transactions
- 15. Payment systems in e-commerce:** Cheque payment, credit card payments, e-cash payments.
- 16. Complete System Analysis and Design Case Studies:** A system for journal acquisition in libraries – walk through the entire life cycle.

Subject Name: DATA STRUCTURES

Unit-I

Basic Concepts

1. **Fundamental:** Data Structures, Algorithms and various types of applications.
2. **Basic Data Types:** Stack, Lists and recursion.

Unit-II

Trees & Sets

1. **Trees:** Definition and implementation of binary tree, tree traversal, postfix, prefix notations, heap.
2. **Sets:** Definition and Implementation of hash table, priority queues.

Unit-III

Algorithms & File Structure

1. **Sorting Algorithms :** Quick sort, insertion sort, Bubble sort, merge sort
2. **Searching Algorithms:** Linear search, Binary search, depth first search and Breadth first search techniques.
3. **File Structure:** Sequential, Index Sequential file Structure.

Subject Name: OBJECT ORIENTED PROGRAMMING USING C++

1. OOP paradigm , Advantages of OOP , Comparison between Functional Programming and OOP approach, characteristics of Object oriented Language objects, Class, Inheritance, Polymorphism, and abstraction, encapsulation, Dynamic Binding, Message passing.
2. Introduction to C++, Identifier and keywords, constants, C++ Operators, Type Conversion, variable declaration, Statement, expressions, User defined data types, Conditional expression (For, While, Do-while) loop statement , breaking control statement (Break, Continue).
3. Defining a function, type of functions, Inline functions, Call by value and Call by reference, Preprocessor, Header files and standard functions, Structures, Pointers and structures, Unions, Enumeration. **Classes**, Member functions, Objects, Array of objects, Nested classes, Constructors, Copy Constructors, Destructors, Inline member functions, Static class member, friend functions, Dynamic memory allocation.
4. Inheritance: Single inheritance, Multi-level inheritance, hierarchical, Virtual base class, Abstracts classes, Constructors in Derived classes, nesting of classes.
5. Function overloading , Operator overloading, polymorphism, Early binding, Polymorphism with pointers, Virtual functions, Late binding , Pure virtual functions, Opening and closing of files, Stream member function , Binary file operations, Structure and file operations, classes and file operations, Random access file processing.

Subject Name: - OPERATING SYSTEMS

1. **Operating System Overview:** Introduction, Objectives and functions, Basic Elements, Evolution of Operating System, Instruction Execution, Interrupts, Memory, Memory

- Hierarchy, System Components, Operating system Services, System Calls, Virtual Machines, System Design and Implementation.
- 2. Process Concepts:** Introduction, Process States, Process Control Block (PCB), Process Scheduling, Co-operating Processes, Threads, Inter Process Communications (IPC).
 - 3. CPU Scheduling:** Scheduling Criteria, Types of Scheduling, Scheduling Algorithms, Multiple-processor Scheduling, Real-time Scheduling, Disk-Scheduling Policies.
 - 4. Memory Management:** Introduction, Memory –management Requirements, Logical and Physical Address Space, Swapping, Loading Programs into main memory, Paging, Page Replacement Algorithms, Allocation Of Frames, Translation Look Aside Buffer (TLB), Simple Segmentation with Paging, page Size, Thrashing.
 - 5. File System:** Introduction, File Organization and Access Methods, Directory Structure, Protection, Security Threats, Intruders, Viruses, File-System Structure, File Allocation Methods, Free-Space Management, Directory Management, Efficiency and Performance of Secondary Storage.
 - 6. Deadlocks:** Introduction, Principles, Principles Of Deadlocks, System Model, Deadlock Characterization, Resource- allocation Graphs, Methods For Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection on, Recovery from Deadlock.
 - 7. Process Management and Synchronization:** Introduction, Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Message Passing.

Subject Name: DATABASE MANAGEMENT SYSTEM

- 1. Basic - Concepts of Database Systems:** Database Schema, Instance and Database state, The Three-Schema Architecture, Data Independence, DBMS Languages, People Deal with Databases.
- 2. Entry - Relationship Model:** The E- R Model, Entity Relationship Diagram, Composite versus Atomic Attributes, Role Names Recursive Relationships, Constraints on Relationship Types.
- 3. Data Models and Its Implementation:** The Hierarchical Data Model, the Network Data Model, Network Modeling Concepts, the Relational Model.
- 4. Introduction to Relational Model:** CODD'S 12 Rules for a fully relational DBMS, Basic Concepts of Relational Model, Referential Integrity Constraints, Enforcing Integrity Constraints.
- 5. Oracle: A Relational Database Management System** Oracle System Structure,. Oracle Server, Oracle Database Structure, Oracle Schema Objects, Oracle Data Dictionary.
- 6. Structured Query Language: SQL:** Three Parts of SQL, Sub-Queries, Referential Integrity, Some Other SQL Command.
- 7. Procedural Language/ Structured Query Language:** PL/SQL Runtime Architecture (PL/SQL Engine), Procedure, Parameters, Packages, Cursors, Triggers.
- 8. Relational Algebra and Relational Calculus:** Relational- Oriented Operation, Set-Oriented Operations and Union Compatibility, Aggregate Function and Grouping, Tuple Relation Calculus.
- 9. Normalizing Database:** Benefits of Normalization, Function Dependency, The Domain Key Normal Form.

- 10. Database Design and Tuning:** The Database Design Process, Requirements and Analysis, Choice of DBMS, Logical Database Design, Database Implementation and Tuning.
- 11. Transaction Processing:** Concurrency Control, Recoverability.
- 12. Query Processing and Query Optimization:** Query Processing, Query Optimization, Heuristics Rules in Query Optimization, Information used in Cost Function.
- 13. Database Recovery Techniques:** Classification of Transaction Failures, Recovery Techniques Base on Deferred Update, Recovery Techniques Base on Immediate Update, Buffer Management.
- 14. Concurrency Control Techniques:** The Acid Test for Transaction Management, Binary Locks, Serializability by Two-Phase Locking, Deadlock Problem.
- 15. Data Warehousing:** Data Warehouse Definition, Data Form Legacy Systems, Decision-Support and Executive Information Systems.
- 16. Data Mining and Web Mining:** Data Mining Techniques, Future Direction of Data Mining, Data Mining Techniques for Web Searching.
- 17. Object- Oriented Database:** History Of OODBMS, Need for Abstract Data Types, O-O Features in SQL3, Hypertext Databases.
- 18. Distributed Database:** Structure of Distributed Database, Design of Distributed Database, Advantage of Distributed Database, DDBMS Prototypes.

Semester III & IV

Third Semester		
Sr. No.	Name of Subject	Credits
1	Computer Networks	3
2	Unix and Shell Programming	4
3	Software Engineering	4
4	Management Information System	4
5	Programming in Java	4
6	Analysis & Design of Algorithms	3
Total		22

Fourth Semester		
Sr. No.	Name of Subject	Credits
1	Computer Graphics	5
2	Computer Architecture	5
3	Internet & E-Commerce	4
4	Discrete Mathematics	4
5	Project Work	4
Total		22

Subject Name: COMPUTER NETWORK

- 1. Introduction to Computer Networks:** Introduction, User of Networks: Goals and applications, OSI Reference Mode, Novell Netware, ARPANET, NSFNET, The Internet.
- 2. The Physical Layer:** Transmission media, Twisted Pair, Baseband and Broadband Coaxial Cable, Fiber Optics, Wireless Transmission, Radio Transmission, Microwave Transmission, Infrared Transmission, Light Wave Transmission, ISDN Services, Virtual Circuits versus Circuit Switching, Transmission in ATM Network, Paging System, Cordless Telephone, Cellular Telephone, Communication Satellite.
- 3. The Data Link Layer:** The data link Layer, Framing , Error Control, Flow- Control, Error Detection and Correction Protocols, Simplex Stop and Wait Protocols, One Bit sliding Window, Using Go- Back n, the Data link layer in the internet.
- 4. The Medium Access Sub – Layer:** The Medium Access Sub Layer , Framing Static and Dynamic Channel Allocation in LAN and MANs ,IEEE standard 802.3 and Ethernet, IEEE standard 802.4 and Token Bus, IEEE 802.4 and Token Ring; Bridges, Bridges form 802x to 802y, Transparent Bridges, Source Routing Bridges.
- 5. The Network Layer:** The network layer , network layer Design Issues, shortest Path routing, Flooding, Flow Based Routing , Broadcast Routing, Congestion Control and Prevention Policies, Internet Working, Connectionless Internet Working , Tunneling Internet Work Routing, Fragmentation, Firewalls, IP Address Internet Control Protocols.
- 6. The Transportation Layer:** The transportation Layer, The Transport Service, Transport Protocols, Addressing,, Establishing a Connection, Releasing a Connection, The Internet Transport Protocols, TCP.
- 7. The Application Layer:** The Application layer, Network Security, Electronic mail, working of e-mail.

Subject Name: UNIX AND SHELL PROGRAMMING

- 1. Introduction:** Features, System Structure, Shell & its Features, Kernal: Architecture of the UNIX OS, Kernal Data Structure.
- 2. Overview:** Logging in & out, I node and File Structure, File System Structure and Features, Booting Sequence & init process, File Access Permissions.
- 3. Shell Programming:** Environmental & user defined variables, Argument Processing, Shell's interpretation at prompt, Arithmetic expression evaluation, Control Structure, Redirection, Background process & priorities of process, Conditional Execution, Parameter & quote substitution.
- 4. Advanced Shell Programming:** Filtering utilities, Awk, Batch Process, Splitting, comparing, sorting, Merging & Ordering Files, Communications with other users.
- 5. Editors and utility:** Link Editor (ed), Screen Editor tutorial (Vi), Fsock Utility.

Subject Name-SOFTWARE ENGINEERING

1. The Software Problem
2. Software Process
3. Software Requirements Analysis and Specification
4. Software Architecture
5. Planning a software project
6. Design
7. Coding and Unit Testing
8. Testing

Subject Name: MANAGEMENT INFORMATION SYSTEM

1. Introduction to Information System in Business: Organization, Management and Network Enterprises Information system in enterprises, Information system, Organization, Management and Strategy: The changing role of Information system in organization, Decision making, business strategy.
2. Computer Hardware and Computer software, Telecommunications, Categories of computer and Computer system, what is software, System software telecommunication and Networks.
3. Information System for Managerial Decision Support, Managing Knowledge: Knowledge Management in organization, Information and Knowledge work system. Group Discussion Support System (GDSS), What is GDSS, Characteristics of GDSS.
4. Enterprise and Global Management: Redesigning the Organization with Information System: Business Process reengineering and Total Quality Management. Management international Information system: The Growth of international information system, organizing international information system, Managing global system.

Subject Name: PROGRAMMING IN JAVA

1. Internet
2. Object Oriented Programming
3. Introduction to Java
4. Java Fundamentals
5. Java Programming
6. Data Types, Variables and Operators
7. Classes and Objects
8. Exploring Methods and Inheritance
9. Packages and Interface
10. String, Array and Vector
11. Java Language Support and Utility Package
12. File Handling
13. Graphics
14. Networking
15. Remote Method Invocation (RMI)

16. Java Beans

17. HTML and Java Script

Subject Name: ANALYSIS AND DESIGN OF ALGORITHM

1. Algorithm
2. Growth of Function
3. Analyzing Algorithm Control Structures
4. Recurrences
5. Quick Sort
6. Curriculum of Social Studies
7. Amortized Analysis
8. Heap
9. Sorting in Linear Time
10. Median and Order Statistics
11. Backtracking

Subject Name-COMPUTER GRAPHICS

1. Keyboard, Touch Panel, Light pens, Graphic tablets, Joysticks, Touch balls, Image scanner, Mouse, Handy copy device:-Zero impact and Non-Impact printers, Dot matrix, Laser printer, Inkjet printer, Dectrostate, Flatted and drum plotters. Video display devise:-Cathode Rey tube, Resistance, Resolution ,Aspect ratio vertical and horizontal ,Color CRT monitors, Direct view storage tube, Flat panel displays, LCD Virtual reality, Faster scan system, Random scan system. Memory device:-Memory (RAM, ROM), CD, Floppy disk, Magnetic tapes, Magnetic disks.
2. Scan conversion algorithm for line (DDA & Bresenham's algorithm) ,Midpoint circle ,Circle & ellipse, Midpoint ellipse, Midpoint ellipse ,Bresenham's algorithm ,Area filling techniques, Scan line polygene fill, Boundary fill character generation.2-dimensional Graphics: Cartesian & Homogeneous coordinate system, Geometric transformations, Affine transformation (Translation, Scaling ,Rotation, Reflection, Shearing),Composite transformation ,Affine Viewing pipeline, Two dimensional viewing transformation and clipping(Line, Polygon and Text).
3. Three Dimensional Graphics:-Geometric transformation (Translation, Scaling, rotation, reflection, shearing), Composite transformations, Mathematics of projections (parallel & perspective), View pipeline, 3D viewing transformations and clipping (normalized view volumes, view port, clipping).
4. Hidden line and surface elimination algorithms, Z-buffer, Scan-line, Sub-division, and Painter's algorithm. Illumination Models: Diffuse reflection, specular reflection, refracted light, Texture surface patterns, half toning, dithering. Surface rendering methods: Constant intensity method, Gourmand shading, Hong shading. Color Model: Introduction to RGB, CMY & HSV color models.

Subject Name:-COMPUTER ARCHITECTURE

1. **Processor Organization:** General structure of CPU registers, Stack, operation of stack, ALU and control unit. Instruction format, mathematical operations, fixed point addition, multiplication or division. Principle of arrays and pipeline processors, principle of instruction decoding and implementation, hardwire and micro-instruction based control unit.
2. **Design of Controller:** Identifying micro-instruction, minimizing micro-instruction, size, parallelism in micro instruction, encoding control instruction, timing cycle and clock generation, organization of micro-Programme based control unit.
3. **Memory Organization:** Static memory, dynamic memory, memory hierarchies, memory refresh, paging concept of memory compaction, interleave memory and principle of address interleaving associative memory, memory segmentation, block address calculation, concept of cache memory.
4. **Data Transfer Technique:** Various I/O devices, IOP, CPU configuration

Subject Name: INTERNET AND E-COMMERCE

1. **Overview of E-Business:** Introduction, Overview of E-Business, Activities using E-Business, E-Business Tools, Advantages of E-Business, The Scope of the Internet and the Web.
2. **Electronic Commerce:** Introduction of E-Commerce, History of E-Commerce, Definition of E-Commerce, Basic Function of Electronic-commerce Systems, The Technologies of E-Commerce, Types of E-Commerce, The Driving Forces of Electronic Commerce, Frame Work of E-Commerce, Issues in Implementing Electronic Commerce, Benefits of E-Commerce, The Limitations of E-Commerce, Benefits of the E-Commerce Market, Increasing Interest in Interfacing Technologies, The Internet, Computer Networks and E-Commerce.
3. **Electronic Payment System:** Introduction, Electronic Payment System, The Need for New Payment Systems Designed for E-Commerce, User Acceptance of Electronic Payment Systems, Characteristics of Electronic Payment System, Classification of Electronic Payment System, Smart Cards, Credit Card System, SET (Secure Electronic Transactions), PayPal, Micro-payments for Information Goods.
4. **Business to Business E-Commerce:** Introduction to B2B-Business to Business, B2B Evolution, Types of Transactions in B2B, Business-to Business Electronic Commerce Models.
5. **Mobile Commerce:** Introduction, The Unique Characteristics of M-Commerce, Driving Forces of M-Commerce, Limiting Factors of M-Commerce, Mobile Customer and Applications, Challenges and Opportunities in M-Commerce, Security in M-Commerce.
6. **Mobile Banking:** Introduction, Technology and Security Standards in Mobile Banking, Mobile Banking Architecture, Mobile Banking Services, Advantages of Mobile Banking.
7. **Internet:** Introduction of Internet, The History of the Internet, Internet Systems, Internet Applications and Application Protocols, Advantages of Internet, Disadvantages of Internet, Domain Name System, Transmission Control Protocol/Internet Protocol, TCP/IP and the Internet.

- 8. Firewall System:** Introduction of Firewall, Types of Firewalls, Proxy Servers, Common Attacks on System.
- 9. Electronic Data Interchange:** Introduction, EDI Standards, Advantages of Using EDI Over Paper Systems, EDI Technology
- 10. Supply Chain Management:** Introduction, Faces of Supply Chain Management, Elements of the Supply Chain Management, Functions of Supply Chain Management, Supply Chain Management Technology, Value Chain Management.

Subject Name: DISCRETE MATHEMATICS

- 1. Fundamental Concepts & Vectors:** Group Rings, Fields, Spaces -Linear, Dependence of Vector, Linear Transformation, Bilinear forms, Eigen values and Eigen vectors.
- 2. Fundamental Concepts, Algorithms & Applications :** Basic Terminologies of graph theory, Multi-graphs and weighted graphs, Paths and circuits, Planar graphs, Trees and rooted trees , Spanning trees and cut sets, Coloring covering and portioning , Directed graphs, enumeration of graphs theoretic algorithm and application.

Semester V & VI

Fifth Semester		
Sr. No.	Name of Subject	Credits
1	Advance Database Management System	5
2	Computer Based Numerical & Statistical Techniques	5
3	.NET with C#	6
4	Multimedia Technology	6
Total		22

Sixth Semester		
Sr. No.	Name of Subject	Credits
1	Mobile Technology	5
2	Distributed System	5
3	Cryptography & Network Security	5
4	Project Work & Viva	7
Total		22

Subject Name- ADVANCE DATABASE MANAGEMENT SYSTEM

- 1.** Data base System Applications, data base System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor.
- 2.** History of Data base Systems. 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 – Conceptual Design for Large enterprises.

3. 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.
4. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.
5. Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative 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 Data bases.
6. Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.
7. Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for Serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation-Based Protocols – Multiple Granularity.
8. Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems-Remote Backup systems.
9. Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Subject Name- COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

1. Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation. Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.
2. Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence. Interpolation and approximation: Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula. Central Difference Formulae: Gauss forward and backward formula, Sterling's, Bessel's, Everett's formula. Interpolation with unequal intervals: LaGrange's Interpolation, Newton Divided difference formula, Hermit's Interpolation. Approximation of function by Taylor's series and Chebyshev polynomial.

3. Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule Euler- Maclaurin Formula. Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.
4. Curve fitting, Cubic Spline and Approximation: Method of least squares, fitting of straight lines, polynomials, exponential curves etc. Frequency Chart: Different frequency chart like Histogram, Frequency curve, Pi-chart. Regression analysis: Linear and Non-linear regression, Multiple regression.
5. Time series and forecasting: Moving averages, smoothening of curves, forecasting models and methods. Statistical Quality Controls methods. Testing of Hypothesis: Test of significance, Chi-square test, t-test, ANOVA, F-Test. Application to medicine, agriculture etc.

Subject Name: .NET WITH C#

1. **Microsoft .NET Technology:** What is .NET?, Microsoft Vision, Problems Before .NET, .NET Technology, .NET Platform, Features of .NET Platform, Other Benefits of Using .NET Architecture, .NET Framework Visual Studio.NET, .NET Languages, Third Party Languages.
2. **.NET Framework:** Common Language Infrastructure, Common Type System (CTS), CLS, MSIL, Architecture of .NET Framework, CLR, User and Program Interfaces, Framework Base Class Library.
3. **C# Basics:** Comparing C# with Java, Features of C#, Identifiers and Variables, C# Keywords, Data Types, Type Conversion.
4. **Programming in C#:** A Simple C# Program, Console Inputs, Multiple "Main ()" Functions, Multi-file Program, Reference Data Type "Object".
5. **Arrays, Strings and More:** Arrays, Strings, Enumerations, Structures, Methods.
6. **Object Oriented Programming:** Object Oriented Programming, Classes and Objects, Inheritance, Polymorphism, Operator Overloading.
7. **Additional Concepts:** Properties, Indexers, Delegates, Events.
8. **System Namespaces:** System. Console: I/O Operations, System.IO: Input-Output Files, System Threading: Multi-Threading, System.Net & System.Net.Sockets: Networking.
9. **Windows Applications:** Windows Applications Development, Creating Windows Application, Execution of Windows Application, Window Forms.
10. **Common Controls:** Label, Textbox, Button, Combobox, Listbox, Checkbox, Radiobutton, PictureBox, Progressbar, Timer, Tree View, Groupbox & Panel, Menu Controls, MDI Forms.
11. **ASP.NET:** ASP vs. ASP.NET, Features of ASP.NET, ASP.NET Execution Model, ASP.NET Page Life Cycle, Web Site Development, Execution of Website.
12. **Web Form and Controls:** Web Form, Standard Controls.

Subject Name-MULTIMEDIA TECHNOLOGY

Unit-I

Introduction and Hardware:

Definition of Multimedia, CD-ROMs and Multimedia applications, Multimedia requirements – Hardware, Software, Creativity and Organization, Multimedia skills and training Macintosh Verses PC, the Macintosh platform, PC platform, Connections, Memory and storage devices, input devices, Output hardware, Communication devices.

Unit-II

Multimedia Software:

Basic tools, painting and drawing tools, OCR software, Sound editing programs, Animation devices and digital movies and other accessories, linking multimedia objects, Office suites, word processor, spreadsheets presentation tools, Types of Authoring tools card and page based, icon based and time based authoring tools, Object oriented tools.

Unit-III

Production Building Blocks:

Test-Using test in Multimedia, Computers and Text, Font editing and design tools, Hypertext, Sounds-multimedia system sounds MIDI Verses Digital Audio, Audio file Formats, working with sound in Windows, Notation interchange file format (NIFF), Adding sound.

Unit-IV

Production Tips:

Image-Creation, making still images, images colors, Images, File format, Animation-principles of animations, making workable animations Video, using video, Broadcast Video, Standard, Integrating Computer and TVs, Shooting and editing Video, Using Recording formats, Video tips, Video Compression.

Unit-V

Multimedia Project Development and case Studies:

Project planning, Estimating, RPFs and Bid proposals, Designing, Producing acquiring and using contents, Using Telnet, Testing, Preparing for delivery, CD-ROM Technology and Standards. Designing for the Word Wide, Working on the Web, Text for the Web, Images for the Web, and Animation for the Web.

Subject Name: MOBILE TECHNOLOGY

- 1. Introduction to wireless communication:** Need and Application of wireless communication. Wireless Data Technologies Market for mobile.
- 2. Wireless transmission:** Frequency for radio transmission signal antennas, signal propagation Multiplexing Modulation, Spread and Cellular systems.

3. **Medium Access Control:** Specialized MAC, SDMA, FDMA, TDMA, and CDMA.
4. **Telecommunication Systems:** GSM, DECT systems –Architecture and protocols, Tetra frame structure, UMTS basic architecture and UTRA modes.
5. **Wireless LAN:** Introduction Infrared v/s Radio transmission Infrastructure and ad-hoc network IEEE, 802.11, HIPERLAN, Blue Tooth.
6. **Wireless ATM:** WATM services, Location Reference model function radio access layer handover Location management, Addressing, Mobile QoS, Access point control protocol.
7. **Mobile Network Layer:** Mobile IP, DHCP.
8. **Mobile Transport Layer:** TCP, Fast and selective retransmission and recovery Transaction oriented TCP.
9. **Support for Mobility:** File systems, World wide web and Wireless Application Protocol with example applications.
10. **Wireless Telephony Applications:** Overview of the WTA Architecture, The WTA client Framework, The WTA Server and security, Design considerations, Application Creation Toolbox.

Subject Name: DISTRIBUTED SYSTEM

1. Characterization of Distributed Systems-Introduction, System Models-Architectural-Fundamental. Inter-process Communication-Introduction-API for Internet protocols-External data representation and marshaling--Client-server communication-Group communication-Case study: Inter-process Communication in UNIX.
2. Distributed Objects and Remote Invocation- Introduction-Communication between distributed objects-Remote procedure calls-Events and notifications.
3. Operating System Support-Introduction-OS layer-Protection-Processes and threads-Communication and invocation OS architecture.
4. Distributed File Systems-Introduction-File service architecture-Case Study: Sun Network File System-Enhancements and further developments. Name Services-Introduction-Name Services and the Domain Name System-Directory Services.
5. Time and Global States-Introduction-Clocks, events and process states-Synchronizing physical clocks-Logical time and logical clocks-Global states-Distributed debugging. Coordination and Agreement-Introduction-Distributed mutual exclusion-Elections-Multicast communication-Consensus and related problems.
6. Distributed Shared Memory-Introduction-Design and implementation issues-Sequential consistency and Ivy case study Release consistency and Munin case study-Other consistency models.

Subject Name: CRYPTOGRAPHY & NETWORK SECURITY

1. **Introduction:** OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality.



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2. **PUBLIC KEY CRYPTOGRAPHY:** Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA.
 3. **AUTHENTICATION AND HASH FUNCTION:** Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard.
 4. **NETWORK SECURITY:** Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME - IP Security – Web Security.
 5. **SYSTEM LEVEL SECURITY:** Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems.

Procedure for Admission:

Student may collect the information regarding admission through University website or helpdesk number according to their convenience. Student can download the admission form from the University website and send directly through online or offline mode to the University. After scrutinizing the documents and clearance of fees the admission will be confirmed and Registration/ Enrolment number will be issued.

Fees Structure:

Sr.n	Particular	Fees
1	Course Fees	24,000/-
2	Credit Transfer/ Lateral Entry	1000/-
3	Continuation Fees	1000/-
4	Examination Fees	200/- (Per Paper)
5	Reappear/ Revaluation Fees	300/- (Per Paper)

In case of any scholarship applicable as per the UGC norms or any other statutory body, the admission committee will discuss the same and issue the appropriate decision accordingly.

The Examination will be conducted in Online/ Offline mode. The Evaluation will be done by the Internal Evaluators as well as External Evaluators.

The Result will be declared on the website of Centre for Distance & Online Education. After declaration of result student will be asked to submit re-evaluation form (if any) within 15 days of declaration of result.

Requirement of the Laboratory:

The University is going to use the ICT (Information Communication Technology) for conducting the programme. In case of any programme required practical to be conducted either the same will be performed by applying virtual reality methods or in offline mode at the University campus/ associated colleges. Also, the student will be provided a practical hand book for their help and better understanding.

Every Student would be provided SLM material in printed form. Also, the same will be available online on the University website.

Cost Estimate of the Programme:

The estimated cost would be Rs.5,00,000/- for programme development, delivery and maintenance.



**ARUNACHAL
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OF STUDIES

State Education & Skill Self-Sponsored University

**CENTRE FOR DISTANCE &
ONLINE EDUCATION**

Quality Assurance:

Every year the curriculum of the course will be reviewed and forwarded to the Academic Council with suggestions. The Academic Council will discuss the suggestions and recommended to Board of Management for its approval. The changes in the course curriculum as per the needs and requirements from time to time. The University will help the passed-out students in their placement in different industries through their training and placement cell.