

**MASTER OF COMPUTER APPLICATION – FIRST SEMESTER**

First 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
<b>Total</b>		<b>22</b>

**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

**MASTER OF COMPUTER APPLICATION – SECOND SEMESTER**

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

**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, hardware 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 partitioning , Directed graphs, enumeration of graphs theoretic algorithm and application.

**MASTER OF COMPUTER APPLICATION – THIRD SEMESTER**

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

**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.

**MASTER OF COMPUTER APPLICATION – FOURTH SEMESTER**

Fourth 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
<b>Total</b>		<b>22</b>

**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.
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.

**Note:** The Normal Rule and Regulation pertaining to the Examination and other issues will be applicable in Faculty of Engineering and Technology as per Arunachal University of Studies Act 2012, Subsequent Statute and Rules & Regulations.