

Computer Application

(As per New Calendar)

CA-100 INTRODUCTION TO COMPUTER APPLICATION (1L+1P) I

Overview of computers; Computer organization; Software - System software and Application software; Networking; Internet services.

CA-101 COMPUTER FUNDAMENTALS AND PROGRAMMING (3L+1P) II

Computer Fundamentals - Number systems: decimal, octal, binary and hexadecimal; Representation of integers, fixed and floating point numbers, character representation: ASCII, EBCDIC. Functional units of computer, I/O devices, primary and secondary memories. Programming Fundamentals - Algorithm development, techniques of problem solving, flowcharting, stepwise refinement; Representation of integer, character, real, data types; constants and variables; Arithmetic expressions, assignment statement, logical expression; Sequencing, alteration and iteration; Arrays, string processing; Sub-programs, recursion, files and pointers; Structured programming concepts; Top down Design, development of efficient programs; Program correctness; Debugging and testing of programs.

CA-111 COMPUTER ORGANIZATION AND ARCHITECTURE (3L) I

Number systems; Boolean algebra - minimization of Boolean function using Karnaugh Map; Logic Gates, Combinational circuits – multiplexer, demultiplexer, encoder, decoder; Sequential circuits: Flip-flops, Half and Full adder, Shift register, Counters; Organization of CPU, Control Unit- Instruction and Execution cycle in CPU, Register Organization, The Instruction Cycle, Instruction Pipelining; Memory organisation - Internal memory: Semiconductor Main Memory (RAM, ROM, EPROM), Cache Memory, Advanced DRAM Organization; External Memory - Magnetic Disks, RAID, Optical Memory, Magnetic Tape; Basic structure of computer hardware and system software - Addressing methods and machine programme sequencing; Input-output organisations - accessing I/O devices - direct memory access (DMA) – interrupts; Introduction to microprocessors – CISC and RISC Architecture, Study of functional units of microprocessors.

CA-112 FUNDAMENTALS OF COMPUTER PROGRAMMING IN C (2L+1P) I

Computer algorithms; Over view of C; Structure of program, Data types, Constants, Variables, Expression, Operators; Basic input/ output and library functions; Control structures; Arrays; Pointers, Structure and union, Pointer to functions, Function returning pointers; Dynamic memory allocation; File management; Graphics.

CA-114 MATHEMATICAL FOUNDATIONS IN COMPUTER APPLICATION (4L) I

Matrix algebra: Basic operations on matrices, Rank and inverse of matrices, System of linear equations, Characteristic roots and equations, Eigen values and eigen vectors; Basic Differentiation, Integration and Differential Equations; Vector algebra: Double and Triple Product of vectors; Coordinate geometry: circles and conic sections; Three dimensional geometry: point, straight line, plane and sphere; Sets: Set theory, subsets, operations on sets,

set cardinality and counting; Functions: Bijective functions, pigeon-hole principle, Boolean functions, permutation functions, Boolean algebra, recursion relations; Number Theory: Binary arithmetic, exponentiation, induction, sequences, Fibonacci sequence, big-oh notation, GCD, Euclidean algorithm, partially ordered sets, congruence and equivalence relation, encryption scheme, linear homogenous recurrence relations with constant coefficients; Graph Theory: Graphs, trees, LAN, Eulerian cycles, Hamiltonian cycles, graph coloring, graph algorithms; Mathematical Logic: Propositional calculus, proposition, logic connectives and compound statements, conjunction, disjunction, truth tables, duality, tautologies and fallacies; Turing Machine: DFA, NFA.

CA-121 OBJECT ORIENTED PROGRAMMING AND DESIGN (2L+ 1P) II

Procedural abstraction, command and functional procedures; Data encapsulation - concepts of modules and interfaces; Data abstraction and types; Introduction to object orientation; History and evolution of object oriented languages; Object oriented programming in C++ - Abstract data types, classes, objects, object/message paradigm, overloading, dynamic binding, parametric polymorphism, Inheritance: class and object inheritance, inheritance and dynamic binding, multiple inheritance; Object oriented software design; Generic and reusable classes.

(Pre-requisite: CA-112)

CA-122 OPERATING SYSTEM (2L+ 1P) II

Operating system overview: operating system as an extended machine and resource manager; Operating system classifications; Operating system modes and system calls; Operating system architecture; Process model, Process synchronization, Concurrent processes, Process scheduling criterion and algorithms; Problem of mutual exclusion; Deadlock and prevention; Race conditions; Semaphores; Monitors; Process allocation; Memory management; Multi-programming with fixed and variable number of tasks; Continuous allocation; Paging, Demand paging, Page fault; Virtual memory; Fragmentation; Segmented memory management, Shared segments; Segmented and demand paged management, Overlays and swapping, Thrashing; Multi processor system, Master slave scheduling; Homogeneous scheduling; Device management system; Dedicated share and virtual devices; Spooling channels; Multiplexer and selector, control units; Traffic controllers and device handlers; Information management memory techniques; Input-Output file protection; Distributed operating system (Course to be taught in accordance to the Unix Operating System).

(Pre-requisite: CA-111)

CA-123 NUMERICAL ANALYSIS (2L+1P) II

Introduction to complex variables; Basic concepts: Floating point number system, Implication of finite precision, Rounding off errors; Interpolation: Polynomial interpolation, Inverse interpolation, Spline interpolation; Numerical integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rules; Ordinary differential equations: Runge-Kutta methods, Predictor - corrector methods; Linear system of equations: Gaussian's elimination, Operation counts, Implementation including pivoting and scaling, Direct factorization methods, Iterative techniques and their analysis; Linear Difference equations; Non-linear equations : Bisection, Newton Raphson, false positions, Secant methods, Iterative methods; Inverse of Matrices; Computation of eigen values and eigen vectors: Error estimates, the power methods – Jaccobi and Householder Method; Exposure to mathematical software packages.

CA-124 SYSTEM ANALYSIS AND DESIGN**(2L+ 1P) II**

Effective communication in systems analysis: Tools of the system analyst, problem definition, classification, data collection and analysis; Systems planning and alternative, feasibility and proposal: User and management involvement, planning alternatives, design considerations, systems feasibility, selection of a system plan, the system proposal; System Cost Determination: System costs and System benefits, Comparative cost analysis. Data processing costs; A Structured Approach to system design: Structured top-down design, data administration and data dictionaries; Audible systems, Logical design requirements, Form requirement and design. Project Management and control: Development of standards, project control , Gantt charts, PERT and CPM; System conversion and Implementation: Planning consideration, conversion methods, system follow up and quality assurance of the new system.

CA-131 DATA BASE MANAGEMENT SYSTEM**(2L+ 2P) III**

Database system - Operational Data, Characteristics of database approach, architecture; Overview of DBMS; Data associations - Entities, Attributes and Associations, Relationship among Entities, Representation of Associations and Relationship, Data Model classification, Entity Relationship model; Relational Data Structure- Relations, Domains and Attributes, Relational Algebra and Operations, Retrieval Operations; Relational Database Design - Anomalies in a Database, Normalization Theory, and Normal forms; Query processing; Distributed Databases- concepts, architecture, design; Structured Query Language (SQL) - Data Definition Language (DDL), Data Manipulation Language (DML), PL/SQL - Stored procedure, Database triggers; Relational Data Base Management Package.

(Pre-requisite: CA-101 or CA-112)

CA-132 DATA STRUCTURES AND ALGORITHMS**(2L+ 1P) III**

Representation of character, string and their manipulation; Linear list structure; Stacks; Queues; Heaps; Sorting algorithms; Searching algorithms; Representation and processing of linear linked lists; Multiple linked structures; Sparse arrays; Tree Structures: Representation of tree structures and different tree traversal algorithms; Graph and geometric algorithms.

(Pre-requisite: CA-112)

CA-134 MODELING AND SIMULATION**(2L+ 1P) III**

Uses and purposes of simulation; Classification of models; Generation and testing of random numbers, Simulation of stochastic events and processes, Design of simulation experiments, Analysis of data generated by simulation experiments, Discrete event simulation; Verification and validation of simulation models, Simulation languages, Simulation of agricultural problems and systems.

(Pre-requisite: CA-101 or CA-112, AS-101 or AS-161)

CA-135 COMPUTER NETWORKS**(2L+ 1P) III**

The importance of Networking, Types of Networking, Network Topology, Transmission Media, Data communication: Concepts of data, signal, channel, bandwidth, bit-rate and baud-rate; Maximum data-rate of channel; Analog and digital communications, asynchronous and synchronous transmission; Network adapters card, Multiplexer (FDM, TDM, STDM), Hub, Repeater. Network References Models: Layered architecture, protocol hierarchies, interface

and services; ISO-OSI references model, TCP/IP reference model; Datalink layer function and protocols: Framing, error-control, flow control; sliding window protocol; HDLC, SLIP and PPP protocol; Network layer - routing algorithms, congestion control algorithms; Internetworking: bridges and gateway; Transport layer - connection management, addressing; Flow control and buffering, multiplexing; Session layer – RPC; Presentation layer - abstract syntax notation; Application layer - File Transfer Protocol (FTP), Telnet, Simple Mail Transfer Protocol(SMTP); World Wide Web(WWW) - Wide Area Indexed Servers (WAIS), WAP; Network Security; Data compression and cryptography.

(Pre-requisite: CA-111)

CA-211 COMPILER CONSTRUCTION

(2L+1P) I

Introduction to Compiler, Compilation Process, Compiler Structure; Programming Language Grammars, Elements of a Formal Language Grammar, Derivation, Reduction & Syntax Trees, Ambiguity Regular Grammar & Regular Expression – Context Free Grammar; Introduction to Finite Automata, Deterministic Finite Automata, Non-deterministic Finite Automata; Scanning & Parsing Techniques – The Scanner, Regular Grammar and FSA, Top Down Parsing, Parsing Algorithm, Top Down Parsing Without Backtracking, Predictive Parsers, Bottom Up Parsing, Parsing, LR Parsers, Shift Reduce Parsing ; Symbol Table Organization, Memory Allocation – Static & Dynamic Memory Allocation, Compilation Control Transfer, Procedure Calls, Conditional Execution, Iteration Control Construct; Lexical Syntax Errors, Semantic, Major Issues In Optimization, Optimizing , Transformations, Local Optimization, Program Flow Analysis, Global Optimization.

(Pre-requisite: CA-114)

CA-212 COMPUTER GRAPHICS

(2L+1P) I

Introduction, Application of Graphics, Elements of Graphics Workstation, Graphics I/P Devices; Development of computer graphics: Basic graphics system and standards; Raster scan and random scan graphics; Continual refresh and storages displays; Display processors and character generators; Colour display techniques; Frame buffer and bit operations, Concepts in raster graphics; Points, Lines and Curves; Scan conversion; Line-drawing algorithms; Circle and ellipse generation; Polygon filling; Conic-section generation; Antialiasing; Two-dimensional viewing: Basic transformations; Co-ordinate systems; Windowing and clipping; Segments; Interactive picture-construction techniques; Interactive input/output devices.; Three-dimensional concepts: 3-D representations and transformations; 3-D viewing; Algorithm for 3-D volumes, Spline curves and surfaces; Fractals; Quadtree and Octree data structures; Hidden line and surface rendering and animation.

(Pre-requisite: CA-112)

CA-213 ARTIFICIAL INTELLIGENCE

(2L + 1P) I

Introduction to Artificial Intelligence (AI); Scope of AI: Games, theorem proving, natural language processing, robotics, expert system; Knowledge: General concept of knowledge, Knowledge based system, Representation of knowledge, Knowledge organization and manipulation, Acquisition of knowledge; Symbolic approach: Syntax and Semantics for Propositional Logic (PL) and First order predicates logic (FOPL), Properties of well formed formulas (wffs), Conversion to clausal form, Inference rules, Resolution principle, Non deductive inference methods; Search and Control strategies: Blind search, Breadth- first search, Depth – First search, Hill climbing method, Best – First search, Branch and Bound search; Learning: Concept of learning, learning automation, genetic algorithms, learning by

induction; Expert System: Introduction to expert system, Characteristics features of expert system, Applications, Importance of Expert system, Rule based system architecture.

(Pre-requisite: CA-132)

CA-214 INTERNET TECHNOLOGIES AND APPLICATIONS (2L + 1P) I

Survey of contemporary Internet Technologies - Role, use and implementation of current tools; Application Layer Services and protocols - Domain name services, network management protocol, electronic mail and file transfer protocol; World Wide Web – Web pages, Web Sites, Web Servers; Intranet and Extranet Concepts; Web Application Architectures; Hyper Text Markup Language (HTML); Building static and dynamic web pages; Scripting Languages - Client side and server side scripting; Interaction with database.

(Pre-requisite: CA-121, CA-131 and CA-135)

CA-215 SOFTWARE ENGINEERING (2L) I

Software engineering definition; Software Development: Phases, Process models, Project structure, Project team structure, Role of Metrics, Measurement, Software quality factors. Planning and Software Project: Requirement Analysis, Cost Estimation, Project Scheduling, Quality Assurance Plan, and Project Monitoring Plans. System Design: Design Objectives, Design Principles, Design Tools, and Techniques, Prototyping Structured Programming Coding: Programming practices, Verification, Monitoring and Control. Testing: Testing Fundamentals, Functional Testing, Structural Testing, Test Plan activities, Unit testing, Integration Testing. Reliability: Concept of Software Reliability, Reliability Models, Limitations of Reliability Models, Software Maintenance.

(Pre-requisite: CA-124)

CA-221 DATA WAREHOUSING AND DATA MINING (2L + 1P) II

Concepts and principles of data warehousing; Data warehousing architecture; System process and process architecture; Data warehousing design; Database schema; Partitioning strategy; Aggregations; Data marts; Meta data management; Data warehouse process; Query Management; Data warehouse security; Backup and recovery; Capacity planning; Testing the warehouse. Introduction to data mining; Neural networks; Fuzzy logic; Visualization techniques; Decision trees; Association rules; Statistical and clustering models.

(Pre-requisite: CA-131, AS-161)

CA-222 MULTIMEDIA AND APPLICATIONS (1L + 1P) II

Introduction to Multimedia Technology - Computers, communications and entertainment; Framework for multimedia systems; M/M devices, presentation devices and the user interface, M/M presentation and authoring; Digital representation of sound and transmission; Brief survey of speech recognition and generation; Digital video and image compression; JPEG image compression standard; MPEG motion video compression; DVD technology, Time based media representation and delivery; M/M software environment; Limitation of workstation operating systems; M/M systems services; OS support for continuous media applications; Media stream protocol; M/M file system and information representation; Data models for M/M and Hypermedia information.

(Pre-requisite: CA-111)

CA-223 MANAGEMENT INFORMATION SYSTEM**(2L + 1P) II**

Basic management principles; Objectives of MIS; System concepts of MIS; Planning, design and implementation of MIS; Decision making with MIS; Data information and communication of MIS; Information systems in agriculture; Development of a MIS; Accounting and Financial management; Project management-project scheduling CPM and PERT.

(Pre-requisite: CA-124)

CA-224 GIS AND REMOTE SENSING TECHNIQUES**(2L + 1P) II**

Introduction to Geographical Information System; Introduction- maps and spatial information, components of a GIS; GIS Internals - data representation- raster and vector data structures and analysis techniques; Digital Elevation Models; Data input, verification, storage and output; Spatial modelling- manual and automatic digitizing process; Data errors in GIS; Classification methods-multivariate analysis and classification; Spatial interpolation; Current and potential uses of GIS in agricultural planning; Software components used in GIS; GIS in India.

Physics of remote sensing, atmospheric effects and remote sensing sensors; Spectral signatures of earth surface features, spectral characteristics of vegetation, soil and water; Data acquisition system, satellite image acquisition; Data collections: pre-processing and data storage; Visual and digital image interpretation; Digital image processing.

(Pre-requisite: AS-101 or AS-161)

CA-225 DATA ANALYSIS IN AGRICULTURE**(1L+2P) II**

Use of Software packages for: Summarization and tabulation of data; Descriptive statistics; Graphical representation of data; Fitting and testing the goodness of fit of probability distributions; Testing of hypothesis; t-test, Chi-square test and F-test; Concept of analysis of variance and covariance of data for one-way and multi-classified experiments; Analyzing crossed and nested classified designs; Analysis of mixed models; Estimation of variance components; Testing the significance of contrasts; Correlation and regression including multiple regression; Multivariate Analysis Techniques: Principal component analysis, Factor analysis, Canonical Correlation Analysis, Cluster Analysis, Discriminant function; Analysis of time series data etc.

(Pre-requisite: CA-101 or CA-112, AS-101 or AS-161)

CA-299 SEMINAR**(1L) I /II /III**

Core Course

For M.Sc., Within the discipline: CA-111, CA-112, CA-121, CA-122, CA-124, CA-131, CA-132, CA-135, CA-211 and CA-225