MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - I (MCA) Applicable From Aug 97 onwards

			TEACHING SCHEME			EXAMINATION SCHEME						
SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M.	HR.	THEORY M.	HR.	PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA111	FUNDAMENTALS OF PROGRAMMING	4	-	4	25	1	50	3	50	25	150
2.	MCA112	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	3	1	-	25	1	50	3	-	25	100
3.	MCA113	FUNDAMENTAL OF COMPUTER ORGANISATION	4	-	2	25	1	50	3	50	25	150
4.	MCA114	BUSINESS DATA PROCESSING	4	-	2	25	1	50	3	50	25	150
5.	MCA115	BASIC MICROCOMPUTER APPLICATIONS	2	-	4	25	1	50	3	50	25	150
		T O T A L	17	1	12	125	-	250	-	200	125	700

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - II (MCA) Applicable From Jan 98 onwards

			TEACHING SCHEME			EXAMINATION SCHEME						
SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M.	HR.	THEORY M.	HR.	PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA121	MATRIX ALGEBRA AND GRAPH THEORY	3	1	-	25	1	50	3	-	25	100
2.	MCA122	DATA & FILE STRUCTURES	4	-	2	25	1	50	3	50	25	150
3.	MCA123	OBJECT ORIENTED CONCEPTS & PROGRAMMING	2	-	2	25	1	50	3	50	25	150
4.	MCA124	COMPUTER ORIENTED NUMERICAL & STATISTICAL METHODS	4	-	2	25	1	50	3	50	25	150
5.	MCA125	ACCOUNTING & FINANCIAL MANAGEMENT	3	1	-	25	1	50	3	-	25	100
6.	MCA126	DATABASE MANAGEMENT SYSTEMS I	4	-	2	25	1	50	3	50	25	150
		T O T A L S	20	2	8	150	-	300	-	200	150	800

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - III (MCA) Applicable From Jan 98 onwards

			TEACHING SCHEME			EXAMINATION SCHEME						
SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M.	HR.	THEORY M.	HR.	PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA211	SYSTEM SOFTWARE	3	-	2	25	1	50	3	25	25	125
2.	MCA212	COMPUTER ORIENTED STATISTICAL METHODS	4	-	2	25	1	50	3	25	25	125
3.	MCA213	OPERATING SYSTEMS	3	-	2	25	1	50	3	25	25	125
4.	MCA214	COMPUTER-BASED MANAGEMENT SYSTEMS I	3	1	-	25	1	50	3	-	25	100
5.	MCA215	CLIENT- SERVER ARCHITECTURE & INTERFACES	4	-	2	25	1	50	3	50	25	150
6.	MCA216	DATABASE MANAGEMENT SYSTEMS - II	2	-	2	25	1	--	-	50	25	100
		T O T A L	19	1	10	150	-	250	--	175	150	725

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - IV (MCA) Applicable From Jan 98 onwards

SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M.	SESSIONAL HR.	THEORY M.	THEORY HR.	PRACT ORAL	T.W. MARKS	TOTAL
1	MCA221	COMPUTER BASED OPTIMIZATION MODELS	4	-	2	25	1	50	3	25	25	125
2.	MCA222	COMPUTER GRAPHICS	4	-	2	25	1	50	3	50	25	150
3.	MCA223	NETWORKING TECHNOLOGIES I	4	-	2	25	1	50	3	50	25	150
4.	MCA224	COMPUTER-BASED MANAGEMENT SYSTEMS II	3	1	0	25	1	50	3	--	25	100
5.	MCA225	SOFTWARE ENGINEERING	3	1	-	25	1	50	3	--	25	100
6.	MCA226	ELECTIVE I	4	-	2	25	1	50	3	50	25	150
		T O T A L S	22	2	8	150	-	300	-	175	150	775

ELECTIVE I COURSES : (a) PARALLEL PROCESSING   (b) GROUPWARE TECHNOLOGIES I

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - V (MCA) Applicable From Aug 97 onwards

SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M.	SESSIONAL HR.	THEORY M.	THEORY HR.	PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA311	SYSTEMS ANALYSIS AND DESIGN	3	1	-	25	1	50	3	--	25	100
2.	MCA312	NETWORKING TECHNOLOGIES II	4	-	2	25	1	50	3	50	25	150
3.	MCA313	ELECTIVE - II	3	1	-	25	1	50	3	--	25	100
4.	MCA314	ELECTIVE - III	3	1	-	25	1	50	3	--	25	100
5.	MCA315*	PRACTICAL WORK	--	-	6	--	--	--	--	75	25	100
6.	MCA316	SYSTEMS DEVELOPMENT PROJECT - I	--	-	6	--	--	--	--	125	125	250
		T O T A L	13	3	14	100	--	200	--	250	250	800

ELECTIVE : II & III
(a) ARTIFICIAL INTELLIGENCE, EXPERT SYSTEMS & NEURAL NETWORKS
(b) TRANSLATOR DESIGN
(c) MICROPROCESSOR APPLICATIONS
(d) MULTIMEDIA SYSTEMS
(e) GROUPWARE TECHNOLOGIES II
(f) PERFORMANCE EVALUATION OF COMPUTER SYSTEMS (To be offered from Aug 98 onwards only)
(g) SOFTWARE PROJECT MANAGEMENT
(h) OBJECT ORIENTED ANALYSIS & DESIGN METHODOLOGIES

   * The practical work will be based on the subjects in Electives II & III

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - VI (MCA) Applicable From Jan 98 onwards

SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	TEACHING SCHEME			EXAMINATION SCHEME						
			THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M. HR.		THEORY M. HR.		PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA321	SYSTEM DEVELOPMENT PROJECT- II	--	--	30	--	--	--	--	400	300	700
		T O T A L	--	--	30	--	--	--	--	400	300	700

MODIFIED SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - III (MCA) (Applicable only for the Aug 97 to Dec 97 Semester)

SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	TEACHING SCHEME			EXAMINATION SCHEME						
			THEORY HR	TUTO HR.	PRACTICAL HR.	SESSIONAL M. HR.		THEORY M. HR.		PRACT ORAL	T.W. MARKS	TOTAL
1.	MCA301	SYSTEM SOFTWARE	3	--	2	25	1	50	3	25	25	125
2.	MCA302	COMPUTER ORIENTED STATISTICAL METHODS	4	--	2	25	1	50	3	25	25	125
3.	MCA303	OPERATING SYSTEMS	3	--	2	25	1	50	3	50	25	125
4.	MCA304	DATA MANAGEMENT	4	--	4	25	1	50	3	50	25	125
5.	MCA305	CLIENT SERVER ARCHI-TECTURE & INTERFACES	4	--	2	25	1	50	3	50	25	125
		T O T A L	18	--	12	125	--	250	--	200	125	700

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MCA301   SAME AS   MCA211
MCA302   SAME AS   MCA212
MCA303   SAME AS   MCA213
MCA304   SAME AS   MCA35 (OLD COURSE)
MCA305   SAME AS   MCA215
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MCA111 FUNDAMENTALS OF PROGRAMMING (Marks 50, Hours 3)

Introductory concepts :
Introduction to computers
Computer characteristics
Modes of operation
Types of programming languages
Introduction to C
Desirable program characteristics

Data representation
Flow charts, Algorithms

Overview of C
Constants, variables & Data types
Operators & Expression
Managing Input & Output Operators
Decision Making & Branching
Decision Making & Looping
Arrays
Handling of character strings
User-Defined functions
Structures & unions
Pointers

File-Management in C
Dynamic Memory Allocation & linked list
The prepocessors

Reference : 1. Programming in C by Balaguruswami (Tata McGraw.Hill-95)

MCA112 DISCRETE MATHEMATICS FOR COMPUTER SCIENCE (Marks 50, Hours 3)

1. Lattices (20%) :

Relations and ordering,partially ordered sets, Lattices as posets, properties of lattices, Lattices as algebraic systems, sublattices, direct product and homomorphism,complete lattices, bounds of lattices, distributive lattice,comlemented lattice.

2. Boolean Algebra (20%) :

Introduction,definition and important properties, subboolean algebra, direct product and homomorphism , atoms,antiatoms, stone's representation theorem, Boolean expressions and their equivalence, Minterms and Maxterms, Free Boolean algebra,Values of Boolean expressions,canonical forms,Boolean functions, symmetric Boolean expressions.

3. Applications of Boolean Algebra (20%) :

Introduction, switching algebra, representation of boolean functions, Karnaugh maps, minimization of boolean functions, Quine_ Mccluskey algorithm. Finite state machines, Introductory Sequential circuits, Equivalence of states, Equivalence and reduction of machines.

4. Predicate Calculus (10%) :

Introduction, objectives, predicates, statement functions,variable and quantifiers,free and bound variables,special valid formulas involving quantifiers, Theory of inference for the predicate calculus.

5. Group Theory (20%) :

Definitions and examples of semigroups,monoids and groups, abelian group cyclic groups, subgroups, permutation groups, coset decomposition of groups, Normal subgroups,Lagrange theorem, Applications in coding theory.

6. Fuzzy Sets (10%) :

Some useful definitions, basic operations on fuzzy sets, Image and Inverse image , I-V Fuzzy sets, Fuzzy relations.

MCA 113 FUNDAMENTALS OF COMPUTER ORGANISATION (Marks 50, Hours 3)

1. Number Systems, Boolean algebra, Combinational and sequential [30%] circuit design
2. Arithmetic and logic unit, Memory devices [15%]
3. Buses, interfaces and Control unit [15%]
4. Instruction formats, Addressing modes, Introduction to 8-bit, [10%] 16-bit, 32-bit microprocessors
5. I/O devices : Keyboard, VDU, Floppy and Hard Disks, Different [15%] types of printers
6. Study of IBM PC Compatibles: [15%]

* Different types of Buses
* Functions of Motherboard and various controlles(video, FDC, HDC, Serial and Parallel I/O controller)

References :
(1) Digital Computer Fundamentals (Sixth Edition) By - Thomas Bartee Pub : McGrawHill
(2) IBM PC and Clones By - B. Govindrajalu
(3) The 386/486 PC (Second Edition) By - Harry Fairhead Pub : BPB.

MCA114 BUSINESS DATA PROCESSING (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

* To discuss methods of gathering input data, collecting them and organizing them into files and data base.

* To enable students to write business application programmes such as inventory control, accounting, production planning and simulation in COBOL.

COURSE CONTENT

1. Introduction to Business Organizations (10%) :

Production,stock control, costing,purchase control,sales order processing and accounting,wage accounting,information systems needs - role of management services department.

2. Data capture and Validation (10%) :

Input form design,punched cards,key to disk systems,optical readers, on-line man-computer dialogues.

3. Systems Investigations (10%) :

Project selection, feasibility analysis,fact gathering, human aspects, system design and implementation and evaluation. Input editing /validation, audit considerations. Computer work load scheduling, documentation and its importance-spectification language and methods.

4. Business Files - Master Files - Transaction Files (20%) :

File processing-sorting,searching,merging,matching,summarizing,Direct Access storage and retrieval, File organization techniques.

5. Concept of good style In Data Processing Programs Design (50%) :

Examples of good application programs in COBOL. Report generation in COBOL.

* COBOL - 85 Standard features are to be taught with an Introduction to 9.x Standard

Laboratory : The laboratory should emphasize on file-ogranization and file processing techniques.

MCA115 BASIC MICROCOMPUTER APPLICATIONS (Marks 50, Hours 3)

1. Installation and use of Single User Operating System :

Note : Any two widely-used operating systems may be used as examples.

Hardware requirements for Microsoft DOS & Windows installation: MS-DOS, its commands and programming; Customizing and Configuring Windows; Configuring the taskbar, the Start menu; Using the Windows interface to create, print, and store a file; using Windows Explorer, Managing Disk Resources and Utilities; Manage long and short filenames; in a mixed environment; Disk Defragmenter; ScanDisk; Running Applications; Differences between a process and a thread; security considerations; installation methods; Architecture and Memory; the memory usage of a MS-DOS-based application, a 16-bit Windows-based application, and a 32-bit Windows-based application operating in Windows

2. Fundamentals of a PC Based DBMS System :

User interface; Sources of help; Components of DBMS; Application Design Process; Developing the database strategy; Developing the database design; Determining the queries; Determining the forms and reports; Determining other application components; Designing and Creating Tables; Using the table wizards; Setting field and table properties; Indexes and their uses; Setting relationship between tables; Adding and Editing Data; Using existing data; Building

Queries; Types of queries; Designing queries; Using the query Wizards; Designing select queries; Designing action queries; Creating other types of queries; Designing and Creating Forms, Using form wizards and builders; Using expressions in forms; Creating subforms; Customizing forms; Displaying and filtering information; Incorporating graphs and object linking and embedding (OLE); Reusing forms; Printing forms; Creating Reports; Using report wizards; Printing reports; Customizing reports by creating controls, adjusting controls, and setting control properties; Using expressions in reports; Sorting and grouping data within a report; Automating with Macros; Creating and editing macros; Running macros; Creating macro groups; Creating an AutoKeys macro; Creating and customizing menus; Creating a startup macro; security requirements; Rolling out an Application; Considerations for distributing an application

3. Fundamental of Worksheet Usage :

Worksheet fundamentals; Embedding enhancing, and modifying charted data; Formatting worksheet data; Producing list-type information; Customization of the user interface for optimal performance; Data Organization; Data Analysis; Data Manipulation; Data Access; Querying external databases from within the Worksheet; Import and export of data; Integration with other Applications

References :
1. Mastering DOS 6.2 by Robbins (BPB-97)
2. Mastering WINDOWS-95 by Cowart (BPB-97)
3. Mastering MS Office Professional 7.0 for WINDOWS-95
4. Books on line by MICROSOFT.

MCA121 MATRIX ALGEBRA AND GRAPH THEORY (Marks 50, Hours 3)

1. Linear equations and Matrices (30%) :

Brief review of the theory of matrices,elementary row and column operations, Rank of a matrix,Inverse of a matrix,solution of Systems of linear equations,Cramer's rule,eigen values and eigen vectors, Cayley-Hamilton Theorem.

Linear transformation,Orthogonal transformation, Reduction to diagonal form, Bilinear forms, Quadratic forms, Reduction of Quadratic forms to diagonal form.

2. Vector Spaces (10%) :

Definitions and examples of vector spaces, linear combinations,linear dependence and linear independence, bases, subspaces, calculus of subspaces,dimension of a subspace

3. Linear Inequalities and Convex Sets (10%) :

Linear inequalities and hyper spaces, Simplexes and convex linear combinations, Convex polyhedran and convex-sets separating hyperplanes.

4. Inner Productspaces (20%) :

Inner products, definition and examples of inner product spaces, norm, triangle inequality, Schwartz's inequality,orthogonal bases and Gram -schmidt orthogonalization process, complete orthonormal set, Bessel's inequality, Orthogonal expansion and fourier rule.

5. Graphs (30%) :

Some definitions, Graph isomorphism, subgraphs, paths, reachability and connectedness,cycles, matrix representation of graphs . Trees,some definitions, labelled trees,tree searching , undirected trees, spanning trees of connected relations, minimal spanning trees.

MCA122 DATA AND FILE STRUCTURES (Marks 50, Hours 3)

PREREQUISITES

MCA111 Fundamentals of Programming.

OBJECTIVES OF THE COURSE

* To introduce basic concepts of data structures.
* To introduce concepts and techniques of structuring data on bulk storage devices,and data compression.
* Analysis of file organization techniques.

COURSE CONTENT

1. Data structures and Algorithms (25%) :
The notion of the data structures, primitive and composite data types : stacks, queues, arrays, linked lists, trees and graphs. Algorithms for manipulating Data structures, binary trees and balancing trees. Hash coding.

2. File processing Environment (25%) :
Definition of record,file,blocking,compaction and database. Introductory overview of database management system.

3. File Organization (30%) :
Implimentation and tradeoffs of sequential access, index-sequential access, random access, b-trees, Inverted list and Multilist.

4. Searching and Sorting (20%) :
Internal searching and sorting algorithms, External sort/merge algorithms.

MCA123 OBJECT ORIENTED CONCEPTS & PROGRAMMING (Marks 50, Hours 3)

1. Object Oriented Concepts :
Object Oriented Development; The Object Modeling Technique ; Objects and Classes; Links and Associations; Advanced Link and Association Concepts; Generalization and Inheritance; Grouping Constructs; Aggregation; Abstract Classes: Generalization as Extension and Restriction; Multiple Inheritance; Metadata; Candidate Keys; Constraints

2. Object Oriented Programming Style and Languages :
Object-Oriented Style; Reusability; Extensibility; Robustness; Class Definitions; Creating Objects; Calling operations; Using Inheritance; Implementing Associations; Object-Oriented Language Features

3. Object Oriented Languages :
An Example : Basic Programming; Output Using cout; Preprocessor Directives; Comments;; Integer Variables; Character Variables; Input with cin; Type float; Manipulators; Type Conversion; Atithmetic Operators; Library Functions; Relational Operators; Loops; Decisions; Logical Operators; Precedence; Other Control Statements; Structures; Enumerated Data Types; Simple Functions; Passing Arguments to Functions; Returning Values from Fuctions; Reference Arguments; Overloaded Functions; Inline Functions; Default Arguments; Variable and Storage Classes; A Simple Class; Objects as Physical Objects & as Data Types; Constructors; Objects as Function Arguments; returning Objects from Functions; Structures and Classes; Classes, Objects, and Memory; Static Class Data; Array Fundamentals; Arrays as Class Member Data; Arrays of Objects; Strings; Operator Overloading : Overloading Unary Operators; Overloading Binary

operators; Data conversion; Inneritance : Derived Class and Base Class; Derived Class Constructors; Overriding Member Functions; Inheritance in the English Distance Class; Class Hierachies; Public and Private Inheritance; Levels of Inheritance; Multiple Inheritance; Containership : Classes within Classes; Addresses and Pointers; Pointers and Arrays; Pointers and Functions; Pointers and Strings; Memory Management : new and delete; Pointers to Objects; Pointers to Pointers; Debugging Pointers; Virtual Function; Friend Functions; Static Functions; Assigment and Copy-Initialization; The this Pointer; Streams; String I/O; character I/O; Object I/O; I/O with Multiple Objects; File Pointers; Disk I/O with Member Functions; Error Handling; Redirection; Command-Line Arguments; Printer Output; Overloading the Extraction and Insertion Operations; Multi-File-Programs; Using the Project Feature.

4. Visual Object-Oriented Languages : An Example :

(a) *Introduction* : Win32-based architecture; Anatomy of a Windows-based application; Displaying and using windows; Event-driven programming; classifications of MFC; Classes in minimal MFC application; Document/view architecture; Non-document/view architecture.

(b) *Development Environment* : Developer Studio; AppWizard; Component Gallery; Resource editors; Browser, Debugging; Windows messages; Messge map; Using ClassWizard to manage message handlers, Using WizardBar to handle messages; Writing output to a device, CDC class, Displaying text to the view, GDI objects, Graphics output functions, Transformations, Special Visual effects, Building menus, Adding an accelerator key to a menu; Updating the appearance of menus; Creating shortcut menus; Adding toolbars; Implementing status bars; Designing and creating dialog boxes; Initializing list and combo boxes; Working with modeless dialog boxes.

References :
1. Object Oriented Programming in Turbo C++ by Robert Lafore (Galgotia - 1994)
2. Object Oriented Modeling and Design by Rumbaugh et.al (PHI -1997)
3. Visual C ++ Book-on-Line - (MICROSOFT)
4. C++ by Balaguruswamy.

MCA124 COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS
(Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

* To solve linear and non linear algebraic equations, perform operations of calculus ,fit curves and solve differential equations using a computer.
* To appreciate problems due to rounding errors and of convergence.

A laboratory should be an integral part of the course in which students should write programs for realistic numerical problems. Students should become familiar with numerical and statistical programme libraries such as IMSL.

COURSE CONTENT

1. Computer Arithmetic (10%) :
Floating point representation of numbers,arithmetic operations with normalised floating point numbers and their consequences, error in number representation-pitfalls in computing,error propagation in evaluation.

2. Iterative Methods (20%) :
Bisection, false position,Secant, Newton-Raphson methods. Successive approximation method, Newton Raphson method for two variables, Discussion of convergence, Solving polynomial equations,Budan's theorem, Bairstow's method, Graeffe's root squaring method.

3. Interpolation and Approximation (20%) :
polynomial interpolation,Truncation error in interpolation, difference tables and calculus of differences, cubic splines, inverse interpolation. Linear regression and nonlinear regression using least square approximation, Approximation of function by Taylor series and Chebyshev polynomials.

4. Numerical Differentiation and Integration (15%) :
Differentiation formulas based on polynomial fit, pit-falls in differentiation. Trapezoidal, Simpson's and Gaussian Quadrature formulas.

5. Solution of Simultaneous Linear Equation and Ordinary Differential EQNS(20%) :
Refinement of solution in Gauss elimination method-pivoting,ILL conditional equations, Gauss-seidal and Gauss Jacobi iterative methods. Taylor series and Euler methods. error analysis. Runge-Kutta methods, predictor-corrector methods, automatic error monitoring and change of step size. Stability of solution.

6. Statistical Methods (10%) :
Frequency Distributions,data analysis,expectations and moments, correlation and regression

MCA125 ACCOUNTING AND FINANCIAL MANAGEMENT (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

* To provide an awareness of the underlying financial structures and procedure of organization so that the interaction of financial systems with information systems can be understood by the Information systems designer.

COURSE CONTENT

1. Principles of Accounting (15%)

Assets, current assets,fixed assets,liabilities, current liabilities, other liabilities- owners equities; trading account: Accounting records and systems; control accounts and subsidiary ledgers; limitations.

2. Assets and working capital (10%)

Fixed assets and depreciation; assets acquisition, disposal, replacement depreciation: intengible assets, inventory methods; sources of working capital, funds, cash flows.

3. Interpreting Accounts and Financial Statements (10%)

Use of ratio in interpreting trading accounts and financial statements, limitations; other methods.

4. Standards for Control (15%)

Variable costs /fixed costs; cost volume-profit analysis; break-even, marginal and full costing; contributions; standard costings; analysis of variance; computer accounting and algorithms.

5. Budgeting / Forecasting (25%)

Characteristics of budgets, definition, advantages, proportion, forecasting long term/short term.

6. Project appraisal (25%)

Methods of capital investment decision - making discounted cash flows, internal rate of return, payback, rate of return, sensitive analysis cost of capital.

MCA126 DATA BASE MANAGEMENT SYSTEM - I (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

To develop and appreciation of the data resource and the issues in managing of data. In order to achieve this purpose, the course provides technical backgroud on computer system management of data. Within the context of the technical background, the course provides instruction in defining data needs, functions on data, user oriented data languages, and management of data within organizations. Understanding of data structure and storage. Analysis of file organization techniques,sequential,indexed sequential, multi-list, and inverted files, operating system topics related to data such as dynamic storage allocation and virtual memory. Data-base management functions and data-base management systems. Logical and physical data models. User oriented data languages. The management of the data as a resource.

COURSE CONTENT

1. Data Environment (10%) :

Definition of data,issues in managing data. Uses and needs of data in the organization. Defining data needs. Trade-offs between utilization of data and control of data.

2. Basic Technical Concepts and System Resources for Data (20%) :

(a) Introduction : The notion of a data structure, primitive and composits data types, basic machine architecture, character codes.

(b) Data Structures : Definition, logical structure, physical implementation, applications and operations for strings, arrays, stacks, queues, linked lists, trees and graphs. Searching and sorting techniques. Data handling facilities of higher level languages.

(c) Operating system topics : Dynamic storage management, virtual memory, role of operating systems in data management.

(d) File Organization : Implementation and tradeoffs of sequential, random, indexed-sequential, B-trees, inverted lists and multi-list organization.

3. Database Concepts (50%) :

(a) Database management systems: Introduction and history, CODASYL, hierarchical and relational systems. Role of databases in information systems, goals and objectives of integrated databases. Data base design philosophies. Logical and physical database design conceptual data models. Query interfaces.

(b) Logical data models: data abstraction, entity-relationship model, relational database, normalization, data dictionaries and directories.

(c) Internal data model : Implementations, CODASYL-DSDL, hierarchical models. Physical data base support, memory management, relational systems, network systems, hierarchical systems.

4. Use and management of data bases (20%) :

(a) Data base management system facilities in building information system application. Use of high-level, user-oriented data language facilities for query, Update and report generation.

MCA211 SYSTEM SOFTWARE (Marks 50, Hours 3)

PREREQUISITES

MCA113 Fundamentals of Computers Organisation.
MCA114 Business Data Processing.

OBJECTIVES OF THE COURSE

* To study architecture of various system softwares
* To give students practical "hands-on" experience.

COURSE CONTENT

1. Assemblers: (4 Hours) :

Features of assembly language, Mnemonics table, Symbol table, Directives, Location counter, Methods of translation, List files

2. Macro Processors: (4 Hours) :

Macros in assembly language, Macro name table, Macro definition table, Macro with symbols, Nesting of macros

3. Linker & Loader: (6 Hours) :

Various linking technics, Various Loading technics, relocatibility, Shareability

4. Introduction to Compiler: (4 Hours) :

Introduction to stages of compiler, Parsing, Syntax analysis, Lexical analysis, Code generation, code optimization, Intermediate code

5. Debugger: (6 Hours) :

Fundamentals of debugging, Debugging technics, Debugging diagnostics tools, Case study of any debugger

6. Software Library: (8 Hours) :

Software module library and archieves, Library architecture, Library management, Architecture and management of Dynamic Link Libraries

7. ODBC & Device Drivers: (6 Hours) :
Requirements of drivers, Driver architectures, Device drivers, ODBC drivers

BOOK :   System Programming by Dhamdhare

MCA212 COMPUTER ORIENTED STATISTICAL METHODS (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

*   To give the students a working knowledge of the concept of probability and statistics. A rather abstract presentation but practical applications should be presented as often as possible. Moreover, a great number of exercises should be given on practical examples with real data home-works.

COURSE CONTENT

1. Probability theory (20%) :
Random events, various definitions of probability, complementation rule, addition rule,mutually exclusive events, permutations and combinations, conditional probability,multiplication rule for independent events, Baye's rule.

2. Random variables and their Distribution(20%) :
Discrete and continuous random variables,mathematical expectation, joint probability distribution of two random variables,covariance independence of random variables,Chebyshev inequality, binomial, hypergeometric,geometric, poisson,normal and exponential distribution.

3. Statistical Inferance (20%) :
Sampling distribution, point estimation and confidence interval estimation 2 Testing of hypothesis about mean for small and large samples, X test, non parametric methods.

4. Statistical Methods Used In Industrial Practices (20%) :
Analysis of variance;analysis of variance in two way classification model,introduction of experimental designs,Randomized block design, Factorial experimentation,Introduction to multivariate Analysis,multiple regression,factor analysis,discriminant analysis.

5. Time series Analysis (20%) :
Time series,various components of a time series, moving average method, Exponential Smoothing, Box-jenking's prediction model.

Laboratory : study the applications of statistical program libraries.
Use of one out of IMSL, STATPACK, BIOMED, NAG,SSP and similar statistical packages.

MCA213 OPERATING SYSTEM (Marks 50, Hours 3)

PREREQUISITES

MCA113 Fundamentals of Computers Organization.
MCA114 Business Data Processing.

OBJECTIVES OF THE COURSE

*   To study functional unints of Operating System
*   To study communications with peripheral devices and interrupt handling.
*   To overview the other parts of multiprogramming operating system.

* To give students practical "hands-on" experience.

COURSE CONTENT

1. Process Management (20%) :

Process, Concurrent processing, PCB, Process states, Scheduling, Inter Process communication, Inter Process Symchronization, Mutual Exclusion, Semaphore, Deadlock management.

2. I/O Management (5%) :

Program controlled I/O, Interrupt controlled I/O, Multiple I/O Interval Timer, I/O port, USART, Interface, Driver

3. Memeory Management (20%) :

Contiguous allocation, Non-contiguous allocation, Segemented allocation Page allocation, Virtual Memory management, Cache Memory

4. File management (20%) :

Storage device management, Storage allocation/deallocation, storage structures, Directory structures, File management services, Device management services

5. Parallel/Distrubuted Operating Systems (10%) :

Parallel systems, Distributed systems, Remote Procedures calls

6. Unix Operating System (15%) :

Development of Unix, Unix shell, System calls, script programming, File management

7. Windows NT (10%) :

Basics of Window environment, File management, Multitasking, DLL, OLE BOOK: Operating Syatems by Milan Milenkovic Operating System Concepts by Peterson The Unix Programming Environment by Kernighan Windows-NT Reference

MCA214 COMPUTER BASED MANAGEMENT SYSTEMS-I (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

(i) To establish the role of information systems in organizations and how they relate to organizational objectives and organization structure.

(ii) To identify the basic concepts that subsequent courses will draw upon : the system point of view, the organization of a system information flows, the nature of information systems.

(iii) To provide students with knowledge of basic techniques and elementary skills in representing system structure.

(iv) To introduce various types of applications which are part of an information system.

COURSE CONTENT

1. Information System and Organisation (25%) :

(a)   Management Information System: Role of information systems in organisations. Alternative taxonomies of information system: such as modes of processing, management levels, Structure of a management information system. Human-machine information systems.

(b)   Relating Systems and Information to Organisational Objectives: Matching the information system plan to the organisational strategic plan. Identifying key organizational objective and processes and developing an information system development. Identifying organisational infor- mation needs. Approach to development of an organisational information system. User role in systems development process. Establishing a port-folio of information system applications. Importance of auditability, maintainability and recoverability in system design.

(c)   Information systems and organisational structure and management : Information/data as organisational resources. Management and ownership of systems and information /data. Relationship of organisational structure and information requirements. Role of information in organisational planning. Management of change caused by information systems. Expectations management.

2. Representation and Analysis of system structure (15%) :

Models for representing systems; narrative, mathematical, graphical, tabular and procedural. Graphical methods: hierarchical (organisation chart, tree diagram, etc.), information flow, process flow, decomposition and aggregation: methods and heuristics, representation assurance: completeness, consistency, adequacy,Application of system representation method to case examples.

3. Systems, Information and Decision Theory (10%) :

(a)   Systems concepts: General systems theory. Systems concepts : Structure, boundaries, states, and objectives. System classification : open, closed, deterministic, and probabilistic. Concepts of entropy and adaptation, Properties of open systems, system elements. System Interfaces, Element independence/dependence, decoupling, and integration. System control: standards, feedback loops, and costs. Systems with complex/conflicting/multiple obectives: methods of resolution, suboptimization.

(b)   Information concepts : Information theory. Information content and redundency. Data V/S information,value of information. Psychological value of information. Classification and compression. Summarizing and filtering. Inferences and uncertainty absorption. Human as information processors.

(c)   Decision Processes: Identifying information needed to support decision making. Human factors, problem characteristics, and information system capabilities in decision making.

4. **Information System Applications (45%) :**
   (a) Transaction processing applications. Basic accounting applications.
   (b) Systems to support operational processes. Production, marketing, finance, logistics, etc.
   (c) Transactions to support management control.
   (d) Applications for budgeting and planning.
   (e) Systems to support decision making, Defining a decision model. Developing a prototype. Application of a high-level user language. Adaptive decision, moving through progressive cycles towards an optimum system. Case examples using high-level language in solution.
   (f) Other use of information technology : work place automation, word processing, electronic mail, personal computers, remote conferencing and graphics.

5. **System Evaluation and Selection (5%) :**
   Identification and generation of alternatives. Evaluation and selection of alternatives. Establishing priorities and allocating resources: cost benefit, organisational power, centralised versus decentralised allocation mechanism.

MCA215 CLIENT-SERVER ARCHITECTURE & INTERFACES (Marks 50, Hours 3)

1. Client-Server Architecture :

Distributed processing; Cooperative processing; Client/Server processing; Peer-to-peer processing; Client/Server architecture; Time sharing; Resource sharing; How do the client and server communicate ?; Differences between a database server and a file server; Database server architecture; open systems interconnect (ISO) model; Application Architecture : Information system architecture; Function (application) architecture; Data architecture; Network(technology)architecture; application partitioning models; Distributed presentation; Remote presentation; Distributed logic; Remote data management; Distributed data management; Developer's view of a client/server application; Application segmentation; User interface; Data validation; Data transfer; Data integrity; Transaction control; Server processing; Data Architecture : Why is enterprise data connectivity an issue ?; Data access strategies; Distributed database; Centralized database; Heterogeneous data access; Transactional data versus analytic data; Data warehouse; middleware ; Common interface; Common gateway; Common protocol; Technical Architecture : Selection of Platform and Development Tools; Database server selection; Types of front-end development tools; Integration of tools; Database hardware; Computer-aided software engineering (CASE) tools; Selection of Client/Server Application : Objectives; Selection criteria; Case study; selection of pilot project; Service Model: User Services, Business Services, Data Services

2. Client/Server Application System Development Life Cycle (SDLC) :

A mission critical application; Functional specification; Business rules; Database design; Data distribution; Prototyping; User interface design; Front-end module design; Reusable modules; Goals of the design stage; Where is user interface (UI) design in the SDLC ?; The usability iceberg Process for doing UI design, Requirement gathering; Multiple prototypes

3. Client-Server Applications Tools - I :

Visual Basic : Objects, properties, methods, and events; Form, control, and application; Properties and methods of a form; an Object Browser, and basic controls; Changing properties and calling methods with code; adding code to event procedures; Control accessibility; Interacting with the user; Working with code statements; Variables and Procedures : Variables; Constants; Converting data types; procedures; Debugging; Types of errors; Debugging toolbar; Break mode; Debug window; Controlling Program Execution; Conditional statements; Looping statement; Working with Controls : Additional standard controls; Customs controls; Menus; Status Bars and Toolbars; Creating a menu; Pop-up menus; Data Access with Data Control : Overview of a database (table, field record key); Data control overview; Viewing records; Data Form Designer; Entering and editing records; Drag and Drop Editing; Steps for adding drag and drop functionality

4. Client Application Tools - II : Power Builder :

Creating Tables and Windows; Database Painter; Multiple Data Windows and Tables; Using FoxPro As An ODBC Data Source; MS-Word As An OLE Server For Power Builder; Debugging Managing and Running Applications; Help Compiler and Help System; Data Pipeline

References :
1. Books-On-Line for Microsoft Visual Basic 4.0
2. Application Development with Power Builder by Rajkumar Sedani (Galgotia - 95)
3. Guide to Client Server by Joe Salemi (BPB-94)

MCA216 DATA BASE MANAGEMENT SYSTEM - II (Marks 50, Hours 3)

Application Development using RDBMS Package like Oracle 7.0, OpenIngres
Topics :
1. Data Entry Form Design
2. Triggers, Rules, Procedures, Stored Procedures, Data Base Procedures
3. Menus

4. SQL
5. 4GL of RDBMS
6. Utilities for DBA
7. Data base administration : functions, organizational implications, shared access control, security, recovery, query interfaces, performance measurements.
8. DBMS evaluation : Selection, standardisation, survey of commercial DBMS, implementation tools.
9. Distributed data bases : mini and micro data bases, very large data bases.
10. Introduction to Object Oriented Data Bases.

MCA221 COMPUTER BASED OPTIMIZATION MODELS (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

* To introduce and exercise a range of analytical modelling techniques useful in decision-making
in the sytem design environment.
* To consider the function of such models as guides for data collection, structures for data manipulation, and as systems for testing assumptions and generating a variety of alternatives.
* To identify the problems of data collection, maintenance, and accuracy when using models to assist decision-making activities.

The course deals with mathematical programming algorithms and applications rather than theory. There are four aspects of the course :

(i) study of model formulation and discussion of documented real-world applications;

(ii) Study of mathematical programming algorithms;

(iii) Consideration of the problems involved in implementing mathematical programming algorithms on a computer; and

(iv) Use of a computer software package to study the behaviour of larger models than can be solved by hand.

COURSE CONTENT

1. Linear Programming (30%) :
Formulating linear programming models,the graphical and simplex methods, revised simplex method, duality, transportation and assignment problems.
2. Integer programming and sequencing (10%)
3. Activity network analysis (15%)
4. Deterministic and probabilistic inventory models (15%)
5. Queuing theory (10%)
6. Simulation (5%)
7. Reliability (5%)
8. Case Studies (10%).

MCA222 COMPUTER GRAPHICS (Marks 50, Hours 3)

Geometry and Line Generation, Circle Generation : (10%)

Graphics Primitives : (10%)

Polygons : (20%)

Transformations : (10%)

Segments : (5%)

Windowing and Clipping : (15%)

Interaction : (5%)

Three Dimension : (15%)

Curves and Surfaces:(10%)

Interpolating Polygons,B splines,Benzier Polynomials

(No algorithms, concepts only).

MCA223 NETWORKING TECHNOLOGIES I (Marks 50, Hours 3)

OBJECTIVES OF THE COURSE

* To introduce the concept of electronic data transmission, the representation of data in a transmission system and the design of communication methods in a distributed computer system.

* To discuss the possible network configurations and control strategies necessary for various applications. Protocols, architectures and transmission alternatives, communication environment, regulatory issues, network pricing and management.

COURSE CONTENT

1. **Fundamental Concepts of Date Transmission :**

The Structure and Types of Communication Systems, Communications Systems and Data Communication.

2. **Communication Channel Characteristics :**

The Communication Channel; Electromagnetic Waves; Frequency and Wavelength; The Electromagnetic Spectrum; Bandwidth and Channel Capacity; Bandwidth and Distance

3. **Modulation, Analog Communication and Multiplexing :**

Modulation and Demodulation; Fourier Analysis; Types of Modulation; Analog versus Digital Modulation; Multiplexing; Space-Division Multiplexing; Frequency-Division Multiplexing; Time-Division Multiplexing; Combined Modulation Systems; Shortcomings of Analog Communication and Multiplexing

4. **Communication Media and Connections :**

The Role of Medium; Wire and Cable; Air and Vaccuum : Low -Power, Single-frequency Radio; High-Power Single-frequecy Radio; Spread-spectrum Radio; Terrestrial Microwave; Satellite Microwave; Point-to-Point and Broadcast Infrared Systems; Public Telephone Network; Fiber Optics; Noise; Noise Measurements; The Effects of Bandwidth Limitation (and Related Problems); Common Mode Voltage; Transmission Media Connectors; Network Interface Card; Repeaters, Modems, Hubs, Bridges; Routers, Brouters

5. **Digital Communication, Communication Systems Requirements :**

Description of Digital Systems; Advantages of Digital Systems; Sampling Theory; Analog to Digital Conversion; Encoding of Digital Signals; Multiplexing and Modulation of Digital Signals; Data Communication System Issues; Codes and Formats; Protocol; Synchronous and Asynchronous Systems; Data Rates and Serial and Parallel Communications; Protocol Examples; Hardware versus Software : Protocol Conversion

6. **The RS-232 Interface Standard & Other Communications Interfaces :**

Introduction to RS-232; RS-232 Voltages, Data Rates & Signals; Integrated Circuits for RS-232; Multidrop Communications; Other Key EIA Standards; The Current Loop

7. **Telephone Systems and Modems :**

Basic Telephone Service; Dialing; Telephone Lines; Private Exchanges; The Role of Modems; Some Specific Modems and Standards.

8. Networks :

Network Topology; Basic Network Protocols and Access; Media, Modulation, and Physical Interconnection; Local Area Networks; Wide Area Networks, Packet Switching, and Gateways; Network Services: File Services, Transfer, Storage & data migration, update synchronization, archiving; Print Services; Multiple Access from Limited Interfaces, Quening, sharing FAXes; Message Services : e-mail, voice-mail; Object-oriented applications; workgroup applications;

workflow management; Linked-Object documents; Directory Services; Application Services; Specialization of Servers; Scalability; Database Services; Cellular Networks and Systems; The Integrated Services Digital Network

9. Network Protocols & Models :

Rules, Models, Layers & Layer-interaction; 7-layer OSI Model and DOD model

10. Error Detection, Correction, and Data Security :

The Nature of Errors; Parity; Cyclic Redundancy Codes; Dealing with Errors; Forward Error Correction; The Nature of Data Security Random Sequences; Spread Spectrum Systems and PRSQ Encryption; The Data Encryption Standard

References :

1. Data Communications : William L. Schweber (McGraw Hill)
2. Networking Technologies Manual, Course 2000, (Novell Education)
3. Network Basic Study Guide by Chellis (BPB-97)
4. Networking Essential Study Guide by Chellis (BPB-97)

MCA224 COMPUTER BASED MANAGEMENT SYSTEMS - II (Marks 50, Hours 3)

Section - I (50%)

INTRODUCTORY BEHAVIOURAL SCIENCE AND ORGANIZATIONAL STRUCTURE

(1) Goals & Objectives :

Definition of objectives : social technical economic and organizational objectives (koonz) Hierarchical structure of objectives global to operational. Problem oriented and goal oriented objectives (koonz). Conflicts and possibilities of conflict resolution (koonz). Determination of policy: strategy planning approaches and steps of strategy planning. Forecasting, Limits of planning (stoner)

(2) Human systems :

Levels of human needs: from subsistence to job satisfaction. Importance of job satisfaction as an organizational goal. A systems view of motivation in organizations, Integrative approaches (stoner)

(3) Classical theories of organization :

Functional apporach: Division labour formal org. structure and lines of authority. Span of control, Authority and responsibility. Examples of canent formal organizations in practice (stoner,koonz)

(4) Behavioural theories :

Reactions to the limitations of formal organization. Significance of human relations and group behaviour (stoner)

(5) Decision process :

Parts of organization system and their dependency. Development of dicision procedures. Allocation of decision making functions. Decision making process, Improving effectiveness of decisions (stoner, koonz)

(6) System and organization :

Description of some real systems in detail. Factors governing organizational size control stability and growth communications, Control systems, Group problem solving. Task forces and committees (stoner, koonz)

(7) Types of models :

Mathematical models corporate planning models. Manpower planning models. Team organization linking-pin models. Colleague model.

(8) Relevance of models for systems designers :

Models as an aid to understanding inherent weakness and limitations of models. Models as tools for analysis and design. Models as tools for planning and prediction. Models as tools for monitoring and control.

MANAGERIAL ECONOMICS

PREREQUISITES : MCA125 : ACCOUNTING AND FINANCIAL MANAGEMENT

OBJECTIVES OF THE COURSE

The main objective of this section is to introduce students to some of the basic concepts used in economic analysis. The amount of time given to the section is small. The intention therefore is to introduce the basic concepts in such a manner that it will be possible for students to relate their reading in the subject to the specific problems faced by the systems designer.

COURSE CONTENT

1. Demand Analysis and Forecasting
2. Production Analysis and Costing
3. Market Structures and Price Determination
4. The money system - the market for money. Interest rates. The capital market - banks, stock exchange. The multiplier and accelerator. Business Cycle
5. The economy - a concept of national income - aggregate demand and expenditure. Savings and investment. The trade cycle and its control. International trade and the balance of payment.

MCA225 SOFTWARE ENGINEERING (Marks 50, Hours 3)

1. Fundamentals of Software Engineering
2. Computer System Engineering :
— Computer Based System
— Computer System Engineering
— Computer Hardware Considerations
— Computer Software Considerations
— Human Considerations
3. Software Project Planning :
— Software Metrices for Productivity and Quality
— Decomposition Techniques
— Expirical Estimation Models
4. Requirements Analysis Fundamentals
5. Software Design Fundamentals :
— Design Process
— Design Fundamentals
— Effective Mudular Design
— Data Design
— Architecture Design
6. Software Quality Assurance :
7. Software Testing Techniques
8. Software Testing Strategies
9. Verification and correctness proof
10. Performance Tuning :
— Code tuning techniques
— Program Optimization
— Itron to performance Evaluation.

MCA226 (a) PARALLEL PROCESSING (Marks 50, Hours 3)

Introduction & Literature Review :
    1.1 The problem of parallel processing
    1.2 Literature Review
    1.3 Hardware for parallel processing
    1.4 software for parallel processing
    1.5 Fast fourier transform
    1.6 Matrix manipulation
    1.7 Neural network analysis
    1.8 Neural Network and parallel processing

Software for Parallel Processing :
    2.1   Introduction
    2.2   Operating system requirements
    2.3   Time sharing with a single or multiple processor
    2.4   Forking - Joining processes
    2.5   Spin - Locks, Contention and self scheduling
    2.6   Barriers and race condition
    2.7   Data dependencies
    2.8   Performance tuning
    2.9   Using chche effectively
    2.10   Implementation of functions required for parallel processing

Parallel Processing and FFT :
    3.1 Introduction
    3.2 Matrix representation of DFT
    3.3. Fast fourier transform (FFT)
    3.4 FFT technique
    3.5 Parallelized, Implementation of FFT
    3.6 Two-Dimension FFTS
    3.7 Row column Decomposition
    3.8 Radix-2 FFT
    3.9 2D-FFT (a totally new approach)

Solution of a System of Linear Algebraic Equations :
    4.1 Introdution
    4.2 Parallel cycle elimination scheme
    4.3 The cyclic reduction algorithm
    4.4 A divide & conquer method
    4.5 Linear tridiagonal system
    4.6 Triangular & banded linear systems
    4.7 Algorithm using the determinant of a hessenberg matrix
    4.8 Products and power of matrices
    4.9 Design of hybrid algorithm.

Network & Parallel Processing :
    5.1 Introduction
    5.2 Backpropagation network
    5.3 An. I.C. for artificial neural networks
    5.4 Additional neural networks
    5.5 Mapping neural nets onto a massively parallel architecture
    5.6 Systolic architecture
    5.7 Performance and conclusions.

References :
    1. Thesis of PROF. J.S.Shah

2. Advance Computer Architecture by Kai Hwang

MCA 226(b) GROUPWARE TECHNOLOGIES I (Marks 50, Hours 3)

1. Basic Concepts :
Formatting a Document; Using Your Workspace; Using Help; Using View and Folders; Using Document Tools; Mail Basics; Working with Folders; Using Mail; Replicating a Database; Searching for Information; Enhancing the Documents; Web Navigator

2. Developing Groupware Applications :
A Groupware Application; Designing a Database; Creating a Database; Designing and Creating a Form; Adding Static Text; Adding Fields; Creating Response Forms; Planning a View; Creating a View; Creating a Folder; Creating Formulas; @ Functions; Using Formulas to Edit and Validate Data; Enhancing a Form; Enhancing a View; Adding New Views; Automating Forms and Views; Creating a Navigator; Creating Agents; Implementing Security; Creating Database Help; Creating a Database lcon; Creating an Archive Database; Creating a Database from a Template

3. System Administration for a Groupware System :
The Environment; Named Networks & Domains; Mail Routing; Shared Mail; Mail Troubleshooting Tools; Security and Naming : ID; the Replication Process; Setting Up Replication; Factors that Affect Replication; Scheduling Replication; Using User Setup Profiles and location Documents Enhancing Remote Access with Passthru and Remote LAN; Using the Server Console; Setting Database Limits and Quotas; Maintaining Database Integrity; Using the Administration Process; Installation & Setup : Setting up the First Server; Setting Up the Network and COM Ports; Setting up the Administrator's Workstation; Registering Servers & Workstations; Setting Up Servers and Workstations

References :
1. Application Devlopers Manual Series 4 (LOTUS)
2. System Administrators Manual Series 4 (LOTUS)

MCA311 SYSTEMS ANALYSIS AND DESIGN (Marks 50, Hours 3)

OBECTIVES OF THE COURSE

* To provide the knowledge and skills necessary to develop physical design and implement an operational system from the logical design.
* To describe the process of planning for change and the post implementation reviews and changes. Both techonological and managerial aspects of system design and implementation are considered.

Case studies should be used as appropriate. Laboratory exercise should include the use of computer - assisted methods for system design. The human engineering aspects of system design should be emphasised.

COURSE CONTENT

1. Application development Strategies :
Selection from alternative strategies for application development using, for example, contingency theory. Development alternatives: adoption of packages for new development (outside developer or in-house development). Development methodologies: life cycle, proto-typing etc. Influences on development strategy: master plan, organisational environment, development organisation and resources, and information system structure and resouces.

2. Application System Development Life cycle :
Overview of the phases of application system development life cycle and their interrelationship. Problem identification and feasibility assesment, requirements determination,

logical and physical design, planning to accomodate change, program development, implementation, and post implementation evaluation. Emphasis on phased development approach in planning and completing the study project. Requirements for documenting and auditability.

3. Application System Development Management :

Project management concepts. Project control for application system development. Responsibilities of project manager, project team members, users, etc. Service level agreements covering management disciplines, management of change, problem resolution, processing, and networking. Performance management, management reporting. Impact of project management on organisational planning cycles.

5. Problem Need Identification and Feasibility Assessment :

Sources of problems and needs. Defining the "real" need/problem. Problem analysis: degree of uncertainty, usefulness of information system application, programmability volatility. Preliminary application requirements determination: variable versus standardized outputs, reporting, data acquisition techniques, application life expectancy, ownership/maintenance responsibility. Preliminary specification : user-system interfaces, mode of operation, input/output, software, hardware.

Feasibility assessment: economic, technical operational and schedule feasibility; and performance to information system master plan. Justification/approval by allocation mechanism: steering committee, pricing of information services, payback, cost/benefit analysis.

Suggested deliverables by students: feasibility analysis report and oral presentation plus general application objectives report.

6. Information Requirements Determination :

Strategies for obtaining information requirements for an application : eliciting user definition of requirements, studying and modifying information delivered by an existing system, deriving requirements through study of utilizing system, normative derivation from characteristics of utilizing system, interactive discovery of requirements through use of a prototype system.

Techniques for information requirements determination: document study, system study, observation, interviewing. Communication skills, listening, writing, presenting, Management/inter-personal skills: conflict resolution, negotiation. Requirements documentation methods, narrative, graphics layouts, requirements language. Methods for providing assurance that requirements are correct and complete. Selecting strategies and techniques. Planning the process.

Suggested deliverables by students: (1) live interviews with video tape critique, and (2) detailed requirements specifications report plus oral presentation.

7. Requirement Analysis and Logical Specification :

Description of system logical data flows, files, and processes by graphical and automated design techniques : top-down design and hierarchical decomposition,tests for logical completeness and consistency. Data dictinoaries: content, format, and organisation; automated versus manual implementations. Process description methods such as structured English and decision tables, Documenting an existing system. Logical design for target system: data flows; files, and processes; selection of interfaces (automated versus manual) ; the user interface. User views of data for data base design. File requirements: transport volume, response times, integrity, security, etc.

Suggested deliverables by students: general logical design report; documentation plan, walkthrough performance.

8. Quality Assurance Review of Logical Design :

Dimensions for review: Satisfaction of user objectives, costs and benefits, logical completeness and consistency tests, quality of user interface, participants and organisation for review progress. Walkthrough. Certification documents. User sign-off. Suggested deliverables by students: design walkthrough plan, warkthrough performance and report.

9. Application Software Make or Buy Decision :

Criteria for software selection. Evaluation process.

10. Planning to Accommodate Change :

Organisational and individual need for system stability, need for system changes. System design to accommodate change. Monitoring for change. change management: request and approval, assesing impact, determining effect on existing systems, grouping and scheduling changes, Making changes: testing, acceptance, updating procedures and documentation. Suggested deliverable by student: a system change procedure.

11. Detailed Logical Design :

Logical software design. Modularization control and data flows, process interaction, process organisation, module determination, module specifications. Logical file design, data sharing file structure and logical access methods, data representation. Logical database design: alternative models such as the Entity Relationship database design: alternative modeis such as the Entity Relationship model scheme levels (Conceptual, external, internal). Representation of user views, View integration: Logical access paths. Improvement of logical view: normalization, aggregation, abstraction, etc.

12. Physical Design :

File design: structure, access, Data base interface: alternatives, logical scheme Design. System integrity: security; privacy, auditability, error recovery, system backup. Preliminary procedures design. Design of controls. Software test design: control, extreme values, etc. Development of implementation plan: strategies, coordination. Suggested deliverables by students: physical system design report and implementation plan (programme structure: test plan, conversion plan, training plan, operations procedures chart).

13. Hardware and System Software Selection :

Hardware configuration: mainframe and memory, front-end processors peripherals, etc. Benchmarks, kernels, simulation, vender selection scoring techniques, RFP: systems software selection (operation system, language processors, editors, cases, methods, communication monitor, etc.). Network architectures. performance and acceptance criteria. Suggested deliverable by students; scoring sheet with definition of each type.

14. Program Development and Testing :

Language selection, functional decomposition, structured programming, organisation of the programming task. Software objectives and performance criteria. Determination of acceptance criteria. Software test design strategies: top-down, bottom-up and variants. Unit and integration testing. Development of a testing plan. Design of test cases and schedulers. Test libraries. Suggested student deliverables: coding organisation plan, design of test cases for modules and system integration, test schedule.

MCA312 NETWORKING TECHNOLOGIES II (Marks 50, Hours 3)

1. Internet Concepts and TCP/IP :

Overview of the Internet; Routers using TCP/IP; Host-to-host communications : How the Internet works; URLs; Internet Services; How Microsoft services fit into the Internet; other Internet services : e-mail; Internet; RLogin; rpc; FTP Services; FTP architecture connection-oriented and connection-less protocols; Performance Monitoring; Gopher Service; World Wide Web (WWW) Service

DNS Overview; History; function; How DNS fits Internet architecture; Overview of security architecture

DOD Model; TCP/IP; TCP/IP utilities on Windows NT; Architectural model; Configuration parameters; Installation; Testing a configuration and an IP connection

2. IP Addressing and Routing :

Address classes; Guideline for network addressing and host addressing; Subnet Addressing; subnet mask; Defining a range of network IDs; Static versus dynamic IP routing; IP routing on Windows NT; Building a routing table; IP address Resolution : Resolving a local IP address; Resolving a remote IP address; ARP cache

NetBIOS Name Resolution & WINDOWS Internet Name Service LMHOSTS file; Planning for WINS replication

Host Name Resolution : TCP/IP naming schemes; a host name; HOSTS file; Configuring Windows NT for a domain name service (DNS) or a HOSTS file

3. Dynamic Host Configuration Protocol :

Lease mechanism; Planning a DHCP environment; Installing DHCP; Configuring a DHCP scope

4. Connectivity in Hetrogeneous Environments :

Commands of Windows NT versus TCP/IP utilities; Interoperating with an RFC-compliant NetBIOS host; Using a LAN Manager for UNIX host as a network file system (NFS) gateway; Installing and configuring the file transfer protocol (FTP) server; Installing the TCP/IP print server

5. Implementing SNMP Service :

Management systems and agents; Management information base (MIB)

6. Performance Tuning and Optimization Factors that affect performance :

Goals of performance tuning; sliding windows; Tuning for performance; Tunning for memory; optimizing TCP/IP; lsolating NetBIOS traffic

7. Browser and World Wide Web :

Explorer : Internet Server manager; Property sheets; WWW; Gopher; FTP; Monitoring server performance : Connecting to a service provider; HTML; Publishing a WWW page; User interface considerations; Default home page; Registration of a page with directory services; Tools to create a WWW page.

8. Security Features :

Security features of Internet information Server; Private and public key; Personal Communication Technology overview; Extensions

9. Other Issues in Internet :

Common Gateway Interface (CGI)—Backward compatibility with Practical Extraction and Report Language (PERL) script; Internet Server Application Programming Interface (ISAPI); Filters between TCP and Internet Information Server; Open Database Connectivity (ODBC) implemented as an ISAPI application; Wide Area Information Search : WAIS tools; Local and nonlocal tools that allow indexing and searching of data; Internet Service Manager (report, server and services view); Property Sheets (service Manager; Configuration of services (WWW, Gopher, FTP); Virtual Directories and Servers; Local Virtual directories; UNC virtual directories; Virtual Servers; Planning : Internet services; Hardware and Software requirements; Estimating bandwidth—performance issues; Internet versus Intranet; Connecting with Internet service providers; Performance monitoring; Event Viewer; Logging Registry changes made by the Administration

10. Java Programing :

An Applet; The Java Workshop; Java Classes; a Java Object; a Java Class; Putting Classes and Objects to Work; Deriving a New Class; Declaring a TextField Object; The init()Function; the new Operator; Java Constructors; Declaring a Button Object; Handling Java Events; Grid Layout; Check Boxes; Radio Buttons; Panels; Scroll-bars; Choice Controls; Scrolling Lists; GridBag Layout; Pop-up Windows; The Frame Class; Menus; Dialog Boxes

References :
1. Mastering the Internet by Glee Harrah Cady et.al (SYBAX - Second Edition)
2. Java Programming by Steven Holzner (M&T-96_)
3. Learning to Use the Internet by Ackermann (BPB-96)
4. TCP/IP Volume I by Douglas E. Comer (PHI-96)

MCA313-4(a) ARTIFICIAL INTELLIGENCE, EXPERT SYSTEM AND NEURAL NETWORKS (Marks 50, Hours 3)

Introduction : (5%)
Problems and Problem spaces : (5%)
Basic Problem Solving Methods : (10%)
Game Playing : (5%)
Knowledge Representation using Predicate Logic : (10%)
Knowledge Representation using Other Logic : (10%)
Structured Representation of knowledge : (10%)
Natural Language Understanding : (5%)
Expert System Development Process : (10%)
Prolog OR Lisp Programming : (15%)
Artificial Neural Networks : (15%)
How brains differ from computers, the LMS learning procedure, single layer and multiple layer perceptrons, hopfield nets,Backpropagation learning and its applications.

MCA313-4(b) TRANSLATOR DESIGN (Marks 50, Hours 3)

Introduction : Programming languages, Translators, Models of a compiler
Notations and Concepts of Languages and Grammers :
Scanning process, elementary scanner design and implementation :
Top-Down Parsing , Bottom-up parsing :
Symbol Table Handling :
Run time operations :
Intermediate form of source program :
Compiler - Compilers.

MCA313-4(c) MICROPROCESSOR APPLICATIONS (Marks 50, Hours 3)

1. Intel 8086/88 Architecture (30%) :
A. 8086 architecture : CPU architecture, Internal operation, Machine language instructions, Addressing modes, Instruction format, Instruction execution, timing,

B. Programmable Peripheral Devices : Serial (asynchoronous, Sychronous) Communication interface, Physical communication standards, 8251A serial interface, parallel communication (8255A), Timer (8254), Keyboard & Display controller , DMA controller, Diskette controller.

2. Intel 8086/88 Programming (45%) :
A. Assembly language programming : Assembler instruction format, Data transfer, Arithmatic, Branch, Loop, NOP, HALT, Flag manipulation, Logical, Shift & Rotate instructions, Directives and operators, Assembly process, Translation of assembly instructions.

B. Modular programming : linking & relocation, Stacks, Procedures, Interrupts and interrupt routines, Macros, Program design, program design example.

C. Byte & String manipulations : String Instructions, REP prefix, Text editor example, Table translation, Number format conversion.

D. I/O Programming : Fundamental I/O considerations, Programmed I/O, Interrupt driven I/O Block transfers and DMA, I/O design example.

3. Study of the contemporary microprocessors :
Like 80286/287, 80386, 80486, Pentium (25%)
References : Microprocessors and Interfacing by Bouglas V. Hall (McGraw-Hill 92)
Microcomputer Systems : The 8086/8088 Family by Yu-cheng Liu et.al (PHI-90)

MCA313-4(d) MULTIMEDIA SYSTEMS (Marks 50, Hours 3)

— INTRODUCTION TO MULTIMEDIA
— SCANNING OF OBJECT
— INTRODUCTION TO CREATION OF GRAPHICS
— RECORDING, SAVING & PLAYING SOUND FILE
— INTRODUCTION TO ANIMATION
— CREATING MULTIMEDIA PRESENTATION USING GRAPHICS, MUSIC, SOUND EFFECTS, TEXT SYMBOLS, ANIMATION
— CREATING INTERACTIVE PRESENTATION
— CREATING SCRIPT FILE USING GUI
— SCRIPT PLAYBACK FOR TELEVISION PRODUCTION
— MULTIMEDIA PRODUCTION FOR BUSINESS PRESENTATION
— INTERACTIVE APPLICATION/PRESENTATION
— REATION OF STANDALONE .EXE FILE OF PRESENTATION WHICH CAN BE INSTALLED AND RUN UNDER WINDOWS
— CREATING A PRODUCTION : A Project which includes the following. : Wipes & Transition Adding Graphics, Timing, Page information & Settings, Shuffler View; Opening, Saving & running a script; Quick Access button;

Background images, Video transparancy Adjusting the size; Handling text; working with Clips; Using Animation & Digitized Video; Using Sound; Creating Interactive buttons; MIDI files, Animation Compression, MPEG animation.

MCA 313-4(e) GROUPWARE TECHNOLOGIES II (Marks 50, Hour 3)

1. Setting up a Mobile User :

A Remote User; Creating a New Replica; Selective Replication; Setting Up for Mobile Replication; Mobile Mail; Using the Replicator Page; Using Advanced Documents Tools; Using Advanced Mail Tools; Automating Applications; Creating and Customizing Databases

2. Advanced Application Development :

Workflow Applications; Multi-Database Applications; Managing Application Design Elements Using Templates; Writing Multi-Line Formulas with @ Functions : Formula Control; List Manipulation; Accessing Data Dynamically : Using Enviroment Variables; Accepting Data Using Dialog Boxes; Looking Up Data; Implementing Workflow Using Mail Routing : Setting Up Mail Routing ; Mail-Enabling a Database; Designing Forms for Mail Routing; Automating Mail; Controlling Access in Application Design; User Roles; Computed Subforms; Using Internal and Reserved Fields; Manipulating Reserved Fields; Enhancing Data Entry : Layout Regions; Forms in Dialog Boxes; Using Views to Enhance the Application : Selecting Documents to Display in Views; View Column Formulas; Form Formulas; Personal on First Use Views; Displaying Views in Dialog Boxes; Automating Applications Using Agents : Creating Agents for Automation; Creating More Complex Agents; Secutiry Consideration : View and Form Access Lists; Readers and Authors Fields; Electronic Signatures; Encryption

3. Advanced System Administration :

Distinguished Naming; Cross Certification; Certifying Organisations; Communicating with Other Domains; Managing Multi-Domain Address Books; Merging Domains; Splitting Domains; Monitoring : Server Activity; Database Monitoring; Tracing Network Connections; Security Considerations; Introduction to the Internet for use in closed Groupware Systems; Web Navigator; Web Publisher

References :
1. Application Developers Manual Series 4 (LOTUS)
2. System Administrators Manual Series 4 (LOTUS)
3. Database Administrators Manual Series 4 (LOTUS)
4. Programmers Manual Series 4 (LOTUS)

MCA313-4(f) PERFORMANCE EVALUATION OF COMPUTER SYSTEM
(Marks 50, Hours 3)

1. Performance Evaluation (25%) :
Performance measurement using monitors and simulators. Performance prediction using simulators and analytical models. Scheduling algorithms.

2. Basic Principles of Model-building (30%) :
The use of a model for evaluation and prediction - what is model building - specific problems of computer systems modelling - Hardware and software monitor - The techniques of model analysis (Operations,analysis,models with simple queues, network of queues, discrete event simulation, Applications : architecture design, choice of configuration, prediction of performance.

3. Balancing Personnel and Hardware (10%) :
Effect of installation mission on personnel level and personnel types-Personnel level versus monthly hardware rental costs - Effect of computer availability on total cost- mathematical model ralating personnel, hardware size, and installation mission - Recruiting implications of hardware - personnel balance.

4. Software Evaluation and Selection (15%) :
Factors affecting make-or-buy decisions on software-unbundling and its effect on software procurement - Contractual aspects of purchasing software - selecting appropriate language and services - Cost of program conversion - Mathematical model for the programming - conversion decision. Computer selection techniques.

5. Social & Legal Environment (20%) :
Social implications - Computers and employment data - privacy, data security, computers and human understanding, and Information access policy.

MCA313-4(g) SOFTWARE PROJECT MANAGEMENT (Marks 50, Hours 3)

Software and Software Engineering
Computer System Engineering
Software Project Planning
Requirement Analysis and Methods
Software Design
Data-flow Oriented Design
Data-structure Oriented Design
Programming Lnaguage Coding
Software Quality Assurance
Software Testing Techniques
Software Testing Stratagies
Software Maintenance.

MCA313-4(h) OBJECT ORIENTED ANALYSIS AND DESIGN METHODOLOGIES
(Marks 50, Hours 3)

1. Software Development Approaches and limitations of each. (5%)
2. Object Oriented Analysis and Design : (10%)
— Concepts : Inheritance, Polymorphism, Encapsulation
— Why Object Oriented Analysis and Design
— Introduction to various methodologies

3. Object Oriented Analysis and Design Methodologies in detail : (50%)
— Object Modelling Technique by Rumbaugh et. al.
— Object Modelling
— Dymanic Modelling

— Functional Modelling Analysis, System Design, Object Design
— Grady Booch's Methodology
— Use Case Methodology by Jacobson
— Methodology by Rational Corporation, U.S.A.

4. Case Study of Information System using any one methodology : (15%)

5. Object Oriented Programming Langauges : (5%)
— Features of Object Oriented Programming Languages like
  SmallTalk, C++, Visual C++, Object COBOL, Eifel etc.

6. Object Oriented Data Bases : (5%)
— Features of Object Oriented Data Bases

7. Standards : (10%)
— Object Modelling Group : ORB, CORBA : Architecture
— SOM and DSOM by IBM
— COM by Microsoft Corporation, U.S.A.

MCA 315 PRACTICAL WORK

The practical work will pertain to the two Electives chosen by the candidate.

MCA316 SYSTEM DEVELOPMENT PROJECT - I

OBJECTIVES OF THE COURSE

To provide the students with experience in analysing, designing, implementation and evaluating information systems.

INSTRUCTIONAL NOTES

Students are assigned one or more system development projects. The projects invovle part or all of the system development cycle. Students work in teams to acquire practical the behavioral considerations in systems development.

The work parallels other coures in the final year of the degree program. The activity should be extended over two semesters.The information analysis portion of the projects should begin in the 5th semester, as soon as the students have sufficient capability to begin applying information analysis techniques; Projects should be completed and documented in the 6th semester. Once a team has completed its projects, a team in a subsequent class can expand on it, obtaining experience in the revision and sophistication of existing computer based systems. The following are possible alternatives for projects.

ALTERNATIVES :

1. Development of a System for a Local Firm :

Under supervision of the faculty and the systems analysis staff, students develop a small applications for a computer - based management information system for a local firm. Students might also work as members of established client company teams.

2. Development of a System for a University/College :

Under the supervision of the faculty and the university administrative data processing unit, students develop a system to benefit the university. Examples are: alumni record and follow - up system, bookstore ordering/accounting, classroom scheduling system.

3. Development for a Hypothetical Application :

Students develop an application for a hypothetical firm and prepare system development deliverables.

MCA321 SYSTEM DEVELOPMENT PROJECT - II

OBJECTIVES OF THE COURSE

To provide the students with experience in analysing, designing, implementation and evaluating information systems.

INSTRUCTIONAL NOTES

Students are assigned one or more system development projects. The projects invovle part or all of the system development cycle. Students work in teams to acquire practical the behavioral considerations in systems development.

The work parallels other coures in the final year of the degree program. The activity should be extended over two semesters.The information analysis portion of the projects should begin in the 5th semester, as soon as the students have sufficient capability to begin applying information analysis techniques; Projects should be completed and documented in the 6th semester.

Once a team has completed its projects, a team in a subsequent class can expand on it, obtaining experience in the revision and sophistication of existing computer based systems. The following are possible alternatives for projects.

ALTERNATIVES :

1. Development of a System for a Local Firm :

Under supervision of the faculty and the systems analysis staff, students develop a small applications for a computer - based management information system for a local firm. Students might also work as members of established client company teams.

2. Development of a System for a University/College :

Under the supervision of the faculty and the university administrative data processing unit, students develop a system to benefit the university. Examples are : alumni record and follow - up system, bookstore ordering/accounting, classroom scheduling system.

3. Development for a Hypothetical Application :

Students develop an application for a hypothetical firm and prepare system development deliverables.

Regulations for the Degree of Master of Computer Application (M.C.A.)
w.e.f. academic year 1997-98

R. PG. MCA 1 :

Candidates for admission to the 3 - Year Master of Computer Applications (M.C.A.) course must have passed a Bachelor's degree examination under (10+2+3) pattern either in science or commerce or management or social science or engineering (including technology) or equivalent with at least II class and having obtained not less than 50% marks at the University examination of this University or any other examination recognised as equivalent thereto by this University. Under Social Science all Arts graduates except those having graduated with languages as major subjects will be considered eligible for admission.

R. PG. MCA 2 :

The admission to the course will be given by merit obtained in a common admission test conducted by this University.

R. PG. MCA 3 :

Examination for the M.C.A. course will be conducted under the Semester system. For this purpose, each academic year will be divided into two semesters.

R. PG. MCA 4 :

A candidate who has passed an equivalent examination from any other University or examining body and is seeking admission to the MCA course shall not be admitted without producing the Eligibility Certificate from the Gujarat University.

R. PG. MCA 5 :

No candidate will be admitted to any semester examination for Master of Computer Applications unless it is certified by the Designated Authority which is the Head of the University Department or Principal of an affiliated college of the University :

(1) That he has attended the course of study to the satisfaction of the designated authority.

(2) That he has maintained a good conduct and character during the studies.

R. PG. MCA 6 :

Candidates desirous of appearing at any semester examination of the M.C.A. course must forward their applications in the prescribed form to the Registrar, through the designated authority on or before the prescribed date.

R. PG. MCA 7 :

For any semester the maximum marks for the internal and external assessments shall be shown in the teaching and examination scheme. For the purpose of internal assessment, sessional tests or any other suitable methods of assessment may be used by a department. When two tests are conducted, the maximum of the marks obtained in the two tests in each subject may be considered.

R. PG. MCA 8 :

A candidate will be promoted to the subsequent semester according to the following scheme:

(a) A candidate, who has registered for the first semester examination will be permitted to prosecute his study for the second semester.

(b) A candidate, who has cleared all the subjects of the first semester and who has registered for the second semester examination will be permitted to prosecute his study for the third semester.

(c) A candidate, who has cleared all the subjects of the second semester and who has registered for the third semester examination will be permitted to prosecute his study for the fourth semester.

(d) A candidate, who has cleared all the subjects of the third semester and who has registered for the fourth semester examination will be permitted to prosecute his study for the fifth semester.

(e) A candidate, who has cleared all the subjects of the fourth semester and who has registered for the fifth semester examination will be permitted to prosecute his study for the sixth semester.

R. PG. MCA 9 :

No candidate will be allowed to reappear in a semester examination in which he has already passed. However, the candidate having ATKT will have the option to either reappear in all the subjects or to appear in only the subjects in which he has failed.

If such a candidate exercises the option to appear in all the subjects, the marks obtained by him in the theory and practical/viva examination at the earlier examinations at the same semester will stand extinguished.

R. PG. MCA 10 :

(i) To pass a subject in any semester a candidates must obtain a minimum of 40% of marks in each head of the subject and 45% of the aggregate of the subject. When a candidate has failed in a subject, the marks in the sessional and term work head will be carried forward provided the candidate has secured a minimum of 40% marks in the head.

For a subject having Practical/VV as one of the heads of passing, if a candidate fails in the subject and if he passes in the Practical/VV head, he will have the option to either reappear in the Practical/VV examination or to allow the marks obtained in this head to be carried forward. If such a candidate exercises the option to reappear in the Practical/VV examination, the marks obtained by him in the same head at the earlier examinations will stand extinguished.

(ii) A candidate will be eligible for award of First Class with Distinction, First Class or Second Class only if he passes in all the subjects of the Fourth, Fifth and Sixth semester examination at one sitting. If a candidate passes either the Fourth or the Fifth or the Sixth semester examination in parts, he will be awarded Pass class only.

For award of class the aggregate marks will consist of the sum of the following :

(a) The sum of the Total marks of Fifth and Sixth semester taken together

(b) Four times the percentage of marks obtained at the Third & Fourth semester examinations taken together.

(c) The percentage of marks obtained at the First & Second semester examinations taken together.

In summary the aggregate marks will be the sum of the following components:

(A)	MCA V + VI	*	Full marks (full marks obtained)
(B)	MCA III+IV	400	Convert marks obtained to 4 times %age
(C)	MCA I + II	100	Convert marks obtained to percentage

Using the aggregate marks calculated as per the above scheme a class will be awarded as follow:

(1) 70% or more marks   - First Class with Distinction

(2) 60% or more marks   - First Class

(3) 50% or more marks   - Second Class

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