Curriculum for MCA Degree

Suggested by
All India Board of Computer Science, Engg./Tech and Applications

All Inida Council for Techncial Education
New Delhi

Contents

PREFACE

This volume contains the curriculum being suggested for the Master of Computer Applications (MCA) course being offered by many Universities in India. The All India Board of Computer Science, Engg./Tech. and Applications (AIBCSA) set up by the All India Council for Technical Education constituted a sub committee with Prof. D.V.R. Vithal as its Chairman to suggest a revised curriculum for the MCA programme. The members ofthe sub committee were Prof. G.V. Krishna Reddy, Prof. R.V. Sahasrabuddhe, Prof. N.P. Mukherjee, Prof. P. Trimurthy and Dr. S.C. Mehta. This sub committee report was considered by AIBCSA at its 5th meeting held on 6th September 1996 and it was decided that it be revised at a workshop to be held at Bangalore and presented to AIBCSA for consideration Accordingly a workshop was convened by Prof. V. Rajaraman at the Indian Institute of Science. Bangalore and was held on 2nd and 3rd December 1996. It was attended by Prof. D.V.R. Vithal. Prof. N.P. Mukherjee (JNU, Delhi) Prof. R.N. Mahabala (Infosys. Bangalore). Prof. G.V. Krishna Reddy (PSG College, Coimbatore) and Dr. J.P. Kesari (AICTE). This group considered in detail the MCA curriculum during the workshop. This volume contains the draft curriculum which emerged at the end of the workshop. This volume has been edited by Prof. V. Rajaraman using the document submitted by the sub committee and other relevant documents.

The editor would like to thank the participants of the workshop mentioned above for their valuable contributions. Thanks are due to AICTE for funding the workshop. The editor thanks Dr. T. S. Mruthyunjaya, Chairman, Centre for Continuing Education and Curriculum Development of Indian Institute of Science, Bangalore and Mr. K. Panneerselvam. Asst. Registrar, Centre for Continuing Education for providing all facilities and office support to conduct the 2 days workshop. Thanks are due to Ms. T. Mallika, CAD Lab. Supercomputer Education and Research Centre, for the excellent job of word processing this proceedings and able secretarial support.

The editor had borrowed material from diverse sources in writing this volume. Specifically parts of the curriculum suggested by project IMPACT of the Department of Electronics for B.E./ B. Tech courses has been adapted. A group constituted by the Institution of Electronics & Telecommunication Engineers had worked on a curriculum for the Advanced Level programme in Computer Science. Parts of that curriculum has been adapted. The editor thanks members of these groups whose work has been used in this volume. The author thanks Prof. R.N. Mahabala for allowing the use of some of the material on industry seminars and software engineering he had developed.

The editor welcomes any suggestions, comments and criticisms which will help to improve this document.

MCA Curriculum

1. Introduction

The objective of this report is to propose a curriculum for the 3 year Master of Computer Applications (MCA) course. MCA course is now offered by more than 200 institutions all over India and is an important source of human resource for the software industry. The first MCA curriculum was proposed in 1982 and was later revised by a working group of the Indian Society of Technical Education in 1990. These curricula have been primarily used as guidelines by Universities which have their own Board of Studies whose responsibility is to draft curricula.

The All India Council of Technical Education (AICTE), has one of its responsibilities specifying norms and standards for technical institutions. Needless to say a good curriculum is an essential requirement for ensuring quality of an academic programme. Thus the All India Board of Computer Science. Engg./Tech. and Applications constituted a committee which proposed a draft curriculum for the MCA degree. This draft was modified during a two day workshop held at Bangalore on 2nd and 3rd December 1996. In this report we give the modified curriculum.

Information Technology is growing rapidly. Increasing applications of computers in almost all areas of human endeavour has led to a vibrant industry with concurrent rapid change in technology. Thus the challenge in designing a curriculum is to identify the areas of core competence which is reasonably stable and provide sufficient number of electives and laboratories to accommodate changes. Thus the suggested curriculum has a strong laboratory and project orientation in which the use of new tools will be emphasised. Most courses will have an associated laboratory and it is expected that they will be equipped with the latest software tools.

One of the major problems. faced by ~most all colleges offering MCA ,course is the lack of adequate faculty. This problem has no easy solution as industry jobs are plentiful and very remunerative. This problem can be partially alleviated if good educational material is available to students and Staff covering the curriculum. It will be desirable for colleges to have internet connectivity as the net has plenty of educational material.

The infrastructure requirement for running the MCA course has been worked out by AICTE and a document has been published by them.

As the subject of information technology is changing very fast it is suggested that the curriculum be revised at least once in 3 years.

2. Structure of the Curriculum

There are two streams in computer education. One of them is the Engineering stream leading to the B.E./B.Tech degree and the other an application stream leading to the MCA degree. In the B.E./ B.Tech course the primary emphasis is on designing computer hardware and systems software. Designing embedded systems, designing peripherals and interfacing them to a computer and use of computers in signal processing would be some of the other areas of interest to B.E. students. The primary emphasis in MCA on the other hand, is on designing information systems for various organizations such as banks, insurance companies, hotels,

hospitals etc. Development of application software in diverse areas where computers are used will be the main function of MCA graduates. Thus in the MCA curriculum hardware, system software and embedded system design are not emphasised. The major thrust is on giving the students a sound background in computing, business functioning and mathematics relevant to information technology. Thus the curriculum has these three streams of courses each semester running concurrently. In computing, students learn best by doing. A strong laboratory component is a part of the curriculum. The laboratories, besides supplementing the theory course should also expose the student to the use of the latest software tools. Every MCA student is required to spend one semester in an industry developing a software system. It is suggested that the student periodically report back to the college and present a seminar on the work being done by him.

2.1 MCA Course Pre-requisites and Period

MCA is a three year (6 semester) course. The students entering MCA must have a B.C.A./B.Sc./ B.Com/B.A. degree with Mathematics as one of the subjects at 10+2 level or at graduation. Of the 6 semesters one semester is to be spent in an industry developing a software system. The MCA programme is planned to have 5 theory subject plus two laboratories each semester. The curriculum has a strong core covering information technology, business management and mathematics.

2.2 Details of Curriculum

In Fig. I we have given a chart which shows the subjects to be studied in each semester and the order in which the subjects are to be taken. The suggested -curriculum has:

- 25 theory subjects and 10 laboratory subjects.
- Of the 25 subjects II are in information technology, 6 in business management. 4 in mathematics and 4 are electives. It is strongly suggested that 2 out of the 4 electives be in business management area. The syllabi for core subjects are given in Appendix A and syllabi for elective subjects in Appendix B.
- It is observed that 85% of the curriculum consists of compulsory courses and 15% are electives.
- Each laboratory should be of at least 2 hour duration. Each student should spend at least 4 hours on a terminal per day. Not more than 2 persons should be in each batch in the laboratory.
- Besides formal courses the curriculum includes one lecture per week in the 5th semester by an industry representative who would present the current application of computq8 in their industry. **Appendix C** briefly describes this .

Sem 1

Introduction in IT	Computer Orgn. & Arch.	Programming & Data Structure	Introduction to Management functions	Mathematical foundations	IT Lab	Programming Lab

Sem 2

Info Systems Analysis Design & Implementations	Operating Systems	Oral and Wireless Communications	Accounting and Management Control	Probability & Combinatonics	Business Programme Lab	Unix & Windows Lab

Sem 3

Data Base Management Systems	Computer Communication Networks	Object Oriented Analysis and Design	Management Support System	Statistical Computing	DBMS Lab	Statistical Computing Lab

Sem 4

Network Programming	Software Engg. I	Elective I	Organizational Behaviour	Elective 2	Network Lab	CASE Tools Lab

Sem 5

A.I and Applications	Software Engg.II	Elective 3	Elective 4	Optimiszation Techniques	AI & Application lab	Optimisation Techniques Lab	Industrial Lectures Seminar, Project

Sem 6

Project	Seminar

- Are connected

Bs are connected

Fig.1 Structure of the MCA Curriculum

In Fig. 2 we give area-wise allocation of subjects and percent time spent in each

E is for elective. Percentages give percent time spent in each area.

Core Courses 12	E2

Information Technology

Core 5	E2

18%

Business Management

Core 4

9%

Mathematics

Core Laboratory 10

23%

Laboratories

MCA Project | Semester (7)

16%

2

5%

Seminar

Fig. 2 Area-wise subjects and time spent.

The list of core subjects are given below:

Core Subjects

Information Technology

1. Introduction to Information Technology
2. Computer Organization and Architecture
3. Programming and Data Structures
4. Information Systems. Analysis. Design and Implementation
5. Operating Systems
6. Data Base Management Systems
7. Computer Communication Networks
8. Object-oriented Analysis and Design
9. Network Programming
10. Software Engineering I
11. Software Engineering II
12. Artificial Intelligence and Applications

Business Management

1. Introduction of Management Functions
2. Oral and Written Communication
3. Accounting and Management Control

4. Management Support Systems
5. Organizational Behaviour

Mathematics

1. Mathematical Foundations
2. Probability and Combinatorics
3. Statistical Computing
4. Optimization Techniques

The syllabi for core subjects are given in **Appendix A**.

Besides these core courses, a student should take 4 elective courses. It is suggested that the student pick at least 2 electives in business management. Elective subjects to some extent, will reflect faculty interest. A list of suggested electives is given below:

Information Technology Electives

1. Programming Languages and Paradigms
2. Visual Programming
3. Compiler Design
4. Advanced UNIX Programming
5. Distributed Database Management
6. Image Processing
7. Parallel Programming
8. Systems Analysis and Simulation
9. Computer Graphics and Multimedia

Business Management Electives

1. Managerial Economics
2. Corporate Planning
3. Foundations of Decision Processes
4. Investment Technology
5. Business Finance
6. Taxation Practices
7. MIS Framework and Implementation
8. Management of Software Projects

The syllabi for the electives are given in **Appendix B.**

3. Schedule of Courses and Student Evaluation

As was pointed out in the last section the MCA programme is planned as a 6 semester course out of which one semester is a project. It is desirable to organize the schedule in a 5 day week and set aside Saturday for professional technical activities and making up lost time (if any). Saturday would be a half working day and is needed by the faculty also to attend to Co-curricular work.

3.1 Evaluation

Each subject in the curriculum (theory/practical/seminar/industrial lecture/project) is an independent entity and should be evaluated separately. The attendance and marks obtained in each entity should be above a minimum required level. They should not be aggregated.

3.2. Reregistering for a subject

For professional courses it is imperative that the course contents are modified at regular intervals. Allowing a candidate to appear for examination long after attending a subject cannot be justified academically. It is therefore necessary for a student unsuccessful in passing a subject in two successive attempts to register for the same subject at the earliest or some other relevant subject as per the requirements and then appear in the examination.

3.3 Additional Subject

A student can take one additional theory subject for examination/or audit, and one additional practical/seminar for examination in any semester, subject to these being offered and fulfilling prerequisites.

3.4 Project, Seminar, Industrial lectures

All candidates must take a project full time for approximately 5 months, preferably in industry/ business culminating in a real applications development. It is to be commended in the third year 1st semester. Further, all candidates must take the seminars in the 3rd year 1st and 2nd semesters and Industrial lectures in 3rd year I st semester.

3.5 Evaluation of Sessional Work

- The sessional marks are awarded based on 2 class tests and assignments / lab reports for theory/ practicals.
- For seminars, the sessional marks are based on presentation/ participation and seminar report.
- For Industrial lectures the sessional marks are based on participation and report.
- The students are to present the project progress to the Department Committee in the last week of 5th Semester based on which the project sessional marks are awarded.
- During the 6th Semester the students are to present on scheduled dates, the progress twice to the department Committee based on which the Seminar sessional marks are awarded.
- The project sessional marks are awarded based on the project presentation and demonstration at the end of the semester by the department Committee.
- The project grade in the University Exam is based on project report and viva voice.

4. A model Scheme of Instruction and Examination

We present below a table giving the details of lecture hours per week and marks to be awarded.

Syllabus Ref. No	Subject	Scheme of Instruction Periods per week	Scheme of Examination Max. marks	
			University Exam	Sessional
Semester 1	Theory			
IT 11	Information Technology	3	75	25
IT 12	Computer Organization	3	75	25
IT 13	Programming & Data Structures	3	75	25
BM 11	Introduction to Management Functions	3	75	25
MTII	Mathematical Foundations	3	75	25
	PracticaIs			
ITIIL	Information Technology Lab	3	50	25
IT 12L	Programming Lab	3	50	25
Semester 2	Theory			
IT21	Information Systems. Analysis. Design and Implementation	3	75	25
IT 22	Operating Systems	3	75	25
BM21	Oral and Written Management Control	3	50	50
MT21	Probability and Combinatorics	3	75	25
	Practicals		~	
IT 21L	Business Programming Lab	3	50	25
IT22L	Unix & Windows Lab	3	50	25
Semester 3	Theory			
IT 31	Database Management Systems	3	75	25
IT 32	Computer Communication Networks	3	75	25
IT 33	Object Oriented Analysis and Design	3	75	25
BM31	Management Support Systems	3	75	25

MT31	Statistical Computing	3	75	25
	Practicals			
IT31L	Database Lab	3	50	25
MT31L	Statistical Computing Laboratory	3	50	25
Semester 4	Theory			
IT41	Network Programming	3	75	25
IT 42	Software Engineering I	3	75	25
IT4 E	IT Elective 1	3	75	25
BM41	Oraanizational Behaviour	3	75	25
BM4E	BM Elective I Practical	3	75	25
IT41L	Networks Lab	3	50	25
IT42L	CASE Tools Lab	3	50	25
Semester 5	Theory			
IT51	AI and Applications	3	75	25
IT 52	Software Engineering II	3	75	25
IT5E	IT Elective 2	3	75	25
BM5E	BM Elective 2	3	75	25
MT51	Optimization Techniques	3	75	25
	Practicals			
IT51L	AI Lab	3	50	25
MT51L	Optimization Techniques Lab	3	50	25
IT 51 lL	Industrial Lectures	2	-	25
IT51 S	Seminar	3	-	25
IT 51 P	Project	6	-	25
Semester 6	Practicals			
IT61 S	Seminar		-	25
IT 62 P	Project		Grade*	100

*Excellent/Good/Satisfactory/Unsatifactory

APPENDIX A

A Syllabi of core Subjects

IT 11. Information Technology

Information concepts and processing: Evolution of information processing, data information language and communication.

Elements of a computer processing system: Hardware - CPU, storage devices and media, VDU, input-output devices, data communication equipment Software- system software, application software.

Programming languages : Classification, machine code, assembly language, higher level languages, fourth generation languages.

Operating systems : Concept as resource manager and coordinator of processor, devices and memory. Concept of priorities, protection and parallelism. Command interpreter, Typical commands of DOS/ UNIX/Network, Gul- Windows.

Computers and Communication: Single user, multi-user, work station, client server systems, Computer networks, network protocols, LAN, WAN, Internet facilities through WWW, Mosaic, Gopher, html, elements of Java.

Information integrity definition Ensuring integrity Computer security : Perverse software, concepts and components of security, Preventive measures and treatment.

Range of application : Scientific, business, educational, industrial, nati6nal level weather forecasting, remote sensing, planning, multilingual applications.

References

Rajaraman V, "Fundamental of Computers" (2nd edition), Prentice Hall of India, New Delhi. 1996.

Sanders, D.H .. "Computers Today" McGraw Hill. 1988.

Trainer T., et al, "Computers" (4th edition) McGraw Hill, 1994.

IT 12. Computer Organization and Architecture

Principles of Computer design - Software, hardware interaction layers in computer architecture. Central processing unit. Machine language instructions, Addressing modes, instruction types, Instruction set selection, Instruction cycle and execution cycle.

Control unit, Data path and control path design, Microprogramming V s hardwired control, RISC Vs CISC, Pipelining in CPU design: Superscalar processors.

Memory system, Storage technologies, Memory array organization, Memory hierarchy, interleaving, cache and virtual memories and architectural aids to implement these.

Input-output devices and characteristics.

Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels.

Performance evaluation - SPEC marks, Transaction Processing benchmarks.

References

Mano, M, "Computer System and Architecture", (3rd edition) Prentice Hall of India, New Delhi, 1994.

Pal Chauduri, P., "Computer Organisation and Design", Prentice Hall of India, New Delhi, 1994.

Rajaraman,V., and Radhakrishnan, T., "Introduction to Digital Computer Design" (4th edition). Prentice Hall of India, New Delhi, 1997.

Stallings. W, "Computer Organization and Architecture, (2nd edition) Prentice Hall of India, New Delhi

IT 13. Programming and Data Structures

Introduction to algorithms, Flow charts, Tracing flow charts, Problem solving methods, Need for computer languages, Reading programs written in C language, C character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic constants, Input-Output: getchar, putchar, scanf, printf, gets, puts, functions, Pre-processor command: # include, define, ifdef. Preparing and running a complete C program.

Operators and expressions : Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Library functions, Control statements: while, do-while, for statements, nested loops. Ifelse, switch, break, continue and goto statements, comma operator.

Functions: Defining and accessing: passing arguments, Function prototypes, Recursion, Use of library functions, Storage classes: automatic, external and static variables, Arrays: Defining and processing, Passing to a function, Multi dimensional arrays.

Strings, operations on strings.

Pointers: Declarations. Passing to a function. Operations on pointers. Pointers and arrays. Arrays of pointers.

Structures: Defining and processing. Passing to a function. Unions.

Data files: Open, close, create, process. Unformatted data files.

Data Structures: Stacks, queues, lists, trees and their application

References

Hutchison, R., "Programming in C". McGraw Hill, New York, 1990.

Johnsonbaugh, R., and Kalin, M., "Applications Programming in C", Prentice Hall of India, 1989. Rajaraman, V, "Computer Programming in C", Prentice Hall of India, New Delhi, 1995.

BM 11. Introduction to Management Functions

HRD : selection, appraisal, training and information systems.

Marketing: Understand the concept of marketing mix. These marketing mix elements consist of product policy and design, pricing, choice of marketing intermediaries, methods of physical distribution, use of personal selling, advertising and sales promotion, marketing research, and marketing organization.

Finance: Finance function (concept, scope, and its relationship with other functions) : tools of financial analysis (funds and cash flow analysis, ratio, analysis, risk-return trade-of): financial forecasting (profonna income statement and balance sheet, cash flow forecasting under uncertainty, financial planning): estimation and management of working capital (operating cycle concept, inventory, accounts receivables, cash and accounts payables, working capital requirements).

Manufacturing: Operations Planning and Control (aggregate planning, multiple product batch, production cycles, short tenn scheduling of job shop, setting production rate in continuous production systems, activity scheduling in projects, introduction to project time calculations through PERT/CPM): Management of supply chain, materials management (introduction to materials management, systems and procedures for inventory management planning, and procurement of materials): quality management (quality concept and planning. standardizations, quality circles).

Strategy: Firm and its Environment: strategies and resources; industry structure and analysis; evaluation of corporate strategy; strategies for growth and diversification; process of strategic planning.

References

Agarwal, R.D., "Organization and Management", Tata McGraw Hill, 1986. Massie, "Essentials of Management". 4th edition, Prentice Hall of India. 1996.

MT 11. Mathematical Foundations

Mathematical Logic: Notation. Connectives Normal forms. Theory of inference for statement calculus.

Predicate calculus. Inference theory of the predicate calculus. Relations and ordering. Functions. Recursion. Algebraic Structures: : Groups. Application of residue arithmetic to computers. Group codes.

Graph theory: Definition. Paths, reach ability, connectedness. Matrix representation of graphs. Trees.

Storage representation and manipulation of graphs: Trees. List structures and graphs. Pert and related techniques.

References

Kolman, B., and Busby. R., "Discrete Mathematical Structures for ComJ;luter Science", Prentice Hall. 1987.

Sahni, S., "Concepts in Discrete Mathematics". Camelot Publisher. U.S.A. 1981.

Tremblay, J.P., el. al. "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill, 1987.

IT 21. Information Systems: Analysis, Design and Implementation

Overview of Systems Analysis and Design : Systems Development Life Cycle. Concept and Models: requirements determination. logical design. physical design, test planning implementation planning and performance evaluation; communication, interviewing, presentation skills; group dynamics; risk and feasibility analysis; group-based approaches. JAD, structures walkthroughs, and design and code reviews; prototyping; database design; software quality metrics; application categories software package evaluation and acquisition.

Information requirement Analysis: Process modelling with physical and logical data flow diagrams, data modelling with logical entity relationship diagrams;

Developing a Proposal: Feasibility study and cost estimation.

System Design: Design of input and control, design of output and control, file design/database design, Process design, user interface design; prototyping; software constructions; documentation.

Application Development Methodologies and CASE tools: Information engineering, structured systems analysis and design and object oriented methodologies for application development data modeling, process modeling, user interface design and prototyping; use of computer aided software engineering (CASE) tools in the analysis, design and implementation of information systems.

Design and Implementation of 00 platforms: Object oriented analysis and design through object modeling technique, object modeling, dynamic modeling and functional modeling, object oriented design and object oriented programming systems for implementation, object oriented data bases.

Managerial Issues in Software Projects: Introduction to software markets; planning of software projects, size and cost estimations; project scheduling; measurement of software quality and productivity; ISO and capability maturity models for organizational growth.

The course should be based on lectures, case analysis and laboratory work. Cases should be used to illustrate each major topic in the course.

References

Haryszkiewycz, LT., "Introduction of Systems Analysis and Design". Prentice Hall of India, 1989.

Rajaraman, V, "Analysis and Design of Information Systems". Prentice Hall of India, 1991.

Senn, LA., "Analysis and Design of Information Systems". Tata McGraw Hill Book Company, 1986.

Whiten, 1.K., Bentley, L.D., Beslow, V.M., "Systems Analysis and Design Methods". Galgotia Publications Pvt. Ltd. 1994.

IT 22. Operating Systems

Introduction

Evolution of operating systems. Types of operating systems. Different views of the operating system, operating system concepts and structure.

Processes

The Process concept, systems programmer's view of processes. The operating system services for process management. Scheduling algorithms. Performance evaluation.

Memory Management

Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modeling paging algorithms, design issues for paging systems, segmentation.

Interprocess Communication and synchronization

The need for interprocess synchronization, mutual exclusion, semaphores, hardware sport for mutual exclusion. queuing implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors, messages, deadlocks.

File Systems

File systems, directories, file system implementation, security protection mechanisms.

Input/Output

Principles of I/O Hardware: I/O devices, device controllers, direct memory access.

Principles of I/O Software : Goals, interrupt handlers, device drivers, device

independent I/O software. User space I/O software.

Disks: Disk hardware, .scheduling algorithms, Error handling, trac-at-a-time caching, RAM Disks.

Clocks: Clock hardware, memory mapped terminals, I/O software. Terminals: Terminal hardware, memory mapped terminals, I/O software.

Processes and Processors in Distributed Systems: Threads, system models, processor allocation, scheduling.

Distributed File Systems: Design, implementation, trends.

Performance Measurement, monitoring and evaluation

Introduction, important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques, bottlenecks and saturation, feedback loops.

Case Studies: MS, DOS. MS WINDOWS, LINUX (UNIX) operating system.

References

Deitel. H.M .. "An Introduction to Operating Systems". Addison Wesley Publishing Company 1984. Milenkovic, M., "Operating Systems· Concepts and Design". McGraw Hill International Edition Computer Science series 1992.

Peterson, J.L .. Abraham Silberschatz. "Operating System Concepts". Addison Wesley Publishing Company. 1989.

Tanenbaum, A.S., "Modem Operating Systems", Prentice Hall of India Pvt. Ltd. 1995.

BM 21. Oral and Written Technical Communication

Note taking from lectures and reference material. essay and precis writing, slide preparation and oral presentation principles, written presentation of technical material, preparation of bibliography, basic of official correspondence, preparation of bio-data, students should be asked to prepare and present seminars during the practice session. Group discussions should also be used and feedback given to students.

References

The Chicago Manual of Style, 13th Edition, Prentice Hall of India, 1989 Gowers, Ernest, "The Complete Words". Penguin, 1973.

IEEE Transactions on "Written and Oral Communications" has many papers of relevance

Ludlow, R., and Panton, F., "The Essence of Effective Communication", Prentice Hall of India Pvt. Ltd. 1995.

Menzel, D.H., Jones, H.M., Boyd, L.G., "Writing a Technical Paper". McGraw Hill, 1961.

Strunk, W., White. E.B., "The Elements of Style", 3rd Edition, McMillan, 1979.

Munter, M., "Business Communication: Strategy and Style" Prentice Hall, New Jersey, 1987.

Tubian, K.L., "A Manual for Writen of 1erm Papers, Thesis and Dissertation", Univ. of Chicago Press, 1973.

BM 22. Accounting and Management Control.

Basic Accounting and conventions underlying preparation of Financial Statements (balance sheet highlighting accounting equation. profit and loss statement; accounting processes; basic accounts, trial balance and financial statements; issues such as provisions for bad debts tax, dividends, losses such as bad debts, missing information, classification effect, cost of assets, rentals, etc); Income Measurement (revenue; recognition and matching costs and revenues; inventory valuation); Depreciation Accounting; Intangible Assets Accounting; Understanding published annual accounts including funds flow statement.

Basic Cost Concepts: (introduction; cost classification; allocation, appointment and absorption; cost centers); Cost Analysis for Managerial Decisions (direct costing, break-even analysis; relevant costs; pricing; pricing-joint costs; make or buy; relevant fixed costs and sunk costs) Cost Analysis for Control (standard costing; variances; material, labour, overhead, sales, and profit); Standard Cost Accounting (budgeting and control; elements of budgeting; control of manufacturing and manufacturing expenses; performances appraisal, evaluation of cost control systems).

Introduction to Management Control Systems; Goals, Strategies, and Key Variables; Performance Measures; Responsibility Centers and Transfer Price; Investment Centers; Reporting Systems; Management by Objectives; Budgeting and Control; Organizational Relationships in Control; Control Dynamics; Top Management and Control; Strategic and Long-Range Planning; Control of Service Organizations; Control of Projects; Control of Non-Profit Organizations; Control of Multinational Companies.

References

Bhattacharya, S.K., and Dearden, John, "Accounting for Management", Prentice Hall of India, New Delhi.

Chadwick, "The Essence of Financial Accounting", Prentice Hall of India Pvt. Ltd., New Delhi.

Chadwick. "The Essence of Management Accounting", Prentice Hall of India Pvt. Ltd., New Delhi.

Homgren, Sundem and Selto (9th ed), "Introduction to Management Accounting", Prentice Hall of India Pvt. Ltd.

Welch, Hilton and Gordon (5th ed). "Budgeting: Profit Planning and Control", Prentice Hall of India Pvt. Ltd., New Delhi.

MT. 21. Probability and Combinatorics

Probability: Sample space. Events. Axioms. Conditional probability. Bayes rule. Random variables: Discrete and continuous. Distribution and density functions. Marginal and conditional distributions. Stochastic independence.

Expectation: Expectation of a function. Conditional expectation and variance. Moment generating function. Cumulant generating functions. Characteristic functions. Distributions: Discrete and continuous distributions.

Permutations and combinations. Distinct and non-distinct objects. Generating functions for combinations. Enumerators for permutations. Distribution of distinct objects.

Recurrence relations: Linear and with two indices. Principles of inclusion and exclusion. Formula derangement. Restrictions on relative positions.

References

Liu, C.L., "Introduction to Combinatorial Mathematics". McGraw Hill. 1996.

Ross, S., "A First Course in Probability", Collier Macmillan, New York, 1976.

IT 31. Data Base Management Systems

1. Basic concepts
   Database & Database Users
   Characteristics of the Database
   Database Systems. Concepts & Architecture
   Date Models. Schemas & Instances
   DBMS Architecture & Data Independence
   Data Base languages & Interfaces
   Data Modelling using the Entity-Relationship Approach

2. Relational Model. Languages & Systems
   Relational Data Model & Relational Algebra
   Relational Model Concepts
   Relational Model Constraints
   Relational Algebra
   SQL - A Relational Database Language
   Date Definition in SQL
   View & Queries in SQL
   Specifying Constraints & Indexes in SQL
   Specifying Constraints & Indexes in SQL
   a Relational Database Management Systems
   ORACLE/INGRES

3. Conventional Data Models & Systems
   Network, Data Model & IDMS Systems
   Membership types & options in a set
   DML for the network model

Navigation within a network database
Hierarchical Data Model & IMS System
Hierarchical Database structure
HSAM, HISAM, HDAM & HIDAM organisation
DML for hierarchical model
Overview of IMS

4. Relational Data Base Design
Function Dependencies & Normalization for Relational Databases
Functional Dependencies
Normal forms based on primary keys
(INF, 2NF, 3NF & BCNF)
Lossless jooin & Dependency perserving decomoposition

5. Concurrency Control & Recovery Techniques
Concurrency Control Techniques
Locking Techniques
Time stamp ordering
Gravularity of Data items
Recovery Techniques
Recovery concepts
Database backup and recovery from catastrophic failures

6. Concepts of Object oriented data base management systems.

References

Date, C.J., "An Introduction to Database Systems", Narosa Publishing House. New Delhi.

Desai, B'., "An Introduction to Database Concepts", Galgotia Publications. New Delhi.

Elmsari and Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.

Ullman, J.D., "Principles of Database Systems", Galgotia Publications. New Delhi.

IT. 32 Computer Communication Networks

Introduction to computer network

Advantages of networks, structure of the communications network, point-to-point and multidrop circuits, data flow and physical circuits, network topologies, topologies and design goals. Hierarchial toopology, horizontal topology (Bus), star topology, ring topoloy, mesh topoloy. The telephone network, switched and non-switched options, fundamentals of communications theory, channel speed and bit rate, voice communications and analog waveforms, bandwidth and the frequency spectrum, connecting the analog and digital worlds, digital worlds, digital signals, the modem, asynchronous and synchronous transmission.

Wide area and local networks, connection oriented and connectionless networks, classification of communications protocols, time division multiple access (TDMA), time division multiplexing (TDM), carrier sense (Collision) systems, token passing, peer-to-peer

priority systems; priority slot, carrier sense (collision free) systems, token passing (priority) systems.

Layered Protocols and the OSI model

Goals of Layered Protocols, network design problems" communication between layers, introduction to standard organizations and the OSI model, standards organizations, Layers of OSI, OSI status.

Polling/Selection Protocols

Character and bit protocols, binary synchronous control (BSC) HDLC; HOLC options, HDLC frame format, code transparency and synchronization, HDLC transmission process, HDLC subsets, SDLC;, Protocol conversion.

Local Area Networks

Way LANs?, Primary attribues of a LAN, Broadband and baseband and base LANs, IEEE LAN standards, e1ationship of the 802 standards to the ISO/CCITT model., connection options with LANs, LLC and MAC protocol data units, LAN toppologies and protocols, CSMA/CO and IEEE 802.3, token ring (Priority), token bus and IEEE 802.4, metropolitan area networks (MANs), ANSI fiber distributed data interface.

Switching and Routing in Networks

Message switching, packet switching, when and when not to use packet switching, packet routing, packet switching support to circuit switching networks.

The X.25 Network and Supporting Protocols

Features of X.25, Layers of X.25 and the Physical layer, X.25 and the data link layer. companion standards to X.25, features of X.25, X.25 channel options, flow control principles, other packet types, X.25 logical channel states, packet formats. internetworking, connectionless mode networks, the frame relay and X.25 stacks.

TCP/IP

TCP/IP and internetworking, example of TCP/IP operations, related protocols ports and sockets. The IP address structure, major features of IP, IP datagram. Major IP services. IP source routing, value of the transport layer, TCP, Major features of TCP, passive and active operation, the transmission control block (TCP), route discovery protocols, examples of route discovery protocols, application layer protocols.

Personal Computer Networks

Personal computer communications characteristics, error handling, using the personal computer as a server, linking the personal computer to mainframe computers, tilt: transfer on personal computers, personal computers and local area networks, network operating systems (NOSs), common IBM PC LAN protocol stacks.

References

Black, V., "Computer Networks· Protocols, Standards and Interfaces", Prentice Hall of India, 1996.

Stallings, W., "Computer Communication Networks", (4th edition). Prentice Hall of India. 1993.

Tanneabaum, A.S .. "Computer Networks", Prentice Hall of India, 19'81.

IT 33. Object Oriented Analysis and Design

Object modelling: Objects and classes. Links and associations. Generalization and inheritance.

Grouping constructs. Aggregation. Generalization as extension and restriction. Multiple inheritance. Meta data, candidate keys. Dynamic modelling: Events and states Nesting. Concurrency. Functional modelling: Data flow diagrams. Specifying operations.

Analysis: Object modelling. Dynamic modelling, functional modelling. Adding operations. Iteration.

System design: Subsystems. Concurrency. Allocation to processors and tasks. Management of data stores. Control implementation. Boundary condition. Architectural frameworks. Object design: Optimization, implementation of control. Adjustment of inheritance. Design of associations. Documentation. Comparison of methodologies.

Implementation: Using a programming language, a database system. Programming styles, reusability, extensibility, robustness. Programming-in-the-large, case study.

References

Booch, G., "Object Oriented Analysis and Design". 2nd edition, Benjamin/Cummins Publishing Co .. Redwood City, CA, U.S.A., 1994.

Rebecca Wirfs-Brock, et. al, Designing Object Oriented Software", Prentice Hall of India. 1996.

Rumbaugh, J., Et al "Object Oriented Modelling and Design". Prentice Hall of India, New Delhi, 1991.

BM 31. Management Support Systems

Introduction to the concept of Decision Support System: Components of DSS: Dialogue Management; Data Management and Model Management for DSS; Examples of different type of DSS; Systems Analysis and Design for DSS; Models in the context of DSS; Algorithms and Heuristics; DSS Applications in different functions; Design of interfaces in DSS; An overview of DSS generators; Group Decision in Support Systems (GDSS) and Decision Conferencing.

Introduction of Expert Systems. Expert Systems in Management; Case Study on Expert System. Introduction to GlS; MSS based on GIS; Case Studies; Executive Information Systems (EIS).

References

Bhatnagar, S.C. and Ramani K. V., "Computers and Information Management", Prentice Hall of India. New Delhi, 1992.

Issue dedicated of GDSS & Expert Systems, JMIS, 10, 3, 1993-94.

Kroenke, D., "Management information systems", 2nd edition, Mitchell McGraw Hill, New York. 1992.

Lucas, H.C., "Information system concepts for management", 5th edition, McGraw Hill.. New York. 1994.

Maryam Alvi, "Group Decision support Systems, Info. Sys. Mgt (ISM)", Vol. 8. No.3 Summer 91 .

Sprauge, R.H., and McNurlin, B.C., "Information Systems Management in Practice", 3rd ed. Prentice Hall international. New Jersey, 1993.

Sprague. R.H. and Carlson, E.D . ."Building Effective Decision Support Systems", Prentice Hall. New Jersey, 1982.

MT 31. Statistical Computing

Basic Statistics: Measures of central tendencies. Measures of dispersion. Frequency distributions. Moments. Correlation coefficient. Regression.

Sampling: Theory of sampling, population and sample Survey methods and estimation Statistical inference. Testing of hypothesis and inference.

Computing frequency charts. Regression analysis.

Time series and forecasting.

Statistical Quality control methods: Factor analysis. Tests of significance X test and F test Applications.

References

Affi, A.A., "Statistical Anal);sis: A Computer Oriented Approach". Academic Press, New York, 1979. Hogg. R. v.. Et. Al., "Introduction to Mathematical Statistics", American Publishing, New York. 1980.

IT 41. Network Programming

Communication Protocol. Internet protocols Novell, network system, System network

architecture. UUCP.IPX/SPX for LANs. Protocol comparisons.

Berkeley sockets: Overview. Unix domain protocols. Socket addresses. Socket system calls Reserved ports. Passing file descriptors. I/O asynchronous and Multiplexing, socket implementation.

Winsock programming: Using the windows socket. API Window sockets and blocking I/O. Other windows extensions. Network dependent UNRI ( )DLL. Sending and receiving data over connections. Termination.

Novel IPX/SPX: Novel's windows drivers. Netware C interface for windows. IPX/SPX procedure. Datagram communication. Connection oriented communication with SPX, IPX/SPX implementation of DLL.

Programming applications: Time and date routines. Ping. Trivial file transfer protocol. Remote login.

References

Davis, R., "Windows Network Programming" Addison Wesley, Reading, M.A., 1993.

Steven, R., "Unix Network Programming", Prentice Hall of India, New Delhi, 1994.

IT 42. Software Engineering I

Software life cycle

Models: Waterfall, Spiral, Prototyping Fourth generation techniques, SW Process.

Software requirements specification (SRS)

Fact-Finding Techniques, Characteristics of a good SRS: Unambiguous. Complete.

Verifiable, Consistent. Modifiable. Traceable and usable during the operation and Maintenance phase. Prototype outline for SRS.

SW Inspection

Communication Skills for the System Analyst. Review/Inspection Procedure:

Document. Composition of the inspection team, check list, reading by the inspectors. Recording of the defects and action recommended. Students should practice inspecting small requirement specifications for good characteristics.

System Analysis

SA tools & Techniques, DFD, Entity Relationship Diagrams. Project Dictionary.

SW Design

System Design Tools and Techniques, Prototyping, Structured Programming.

User Interface Design

Elements of good design, Design issues, Features of a modern GUI. Menus, scrolling, windows, Icons, Panels, Error messages, etc.

user Manual

User Profile, Contents of an User Manual: Student is urged to install and use a software using its user manual and report the strengths and weaknesses of that user manual.

Software Configuration Management

Base Line, SCM process, Version Control, Change Management.

Computer Aided Software Engineering

CASE, Tools for Project management Support, Analysis & design, Programming. Prototyping, Maintenance. Future of CASE.

References

Beizer, B., "Software Testing Techniques", Second Edition. Van Nostrand Reinhold. New York. 1990.

IEEE Guide to Software Requirements Specifications, Std 830-1984. In" IEEE Standards Collection. 1993. Available from IEEE Standards Board, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. NJ, USA.

IEEE Standard for Software User Documentation, Std 1063-1987.

Jalote, P., "An Integrated Approach to Software Engineering". Narosa 1991.

Pressman, R.S., "Software engineering" A Practitioner's Approach", Third Edition, McGraw Hill. International Edition, 1992.

Whitten, Bentley and Barlow, "System Analysis anc' Design Methods", Second Edition, Galgotia Publications, 1996.

BM 41. Organizational Behaviour

Introduction to Organizations and Individuals. What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analysing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures, basic roles in an organization, etc., perception, attitudes, motives (achievement, power and affiliation), commitment, values creativity and other personality factors, profile of a manager and an entrepreneur.

Interpersonal and Group Processes - Interpersonal trust, understanding the other

person from his/her point of view, interpersonal communication, listening, feedback, counselling, transactional analysis, self-fulfilling prophecy, etc., leadership, motivating people, working as a member of a team, team functioning, team decision-making, team conflict resolution, team problem solving.

Organizational Structure and Integrating Interpersonal and Group Dynamics-Elements of structure, functions of structure, determinants of structures, dys functionalities of structures, structure-technology environment-people relationships, principles underlying design of organizations; organizational culture, organizational politics, issues of power and authority, organizational communications, organizational change, integrating cases(s).

Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behaviour simulation exercise.

References

Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour in the Workplace", MacMillan India Ltd., Delhi, 1996.

Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMuillan India Ltd., Delhi, 1995. "

Arnold, John, Robertson, Ivan T. and Cooper, Cary, L., "Work Psychology: Understanding Human Behaviour In the Workplace", MacMillan India Ltd., Delhi, 1996.

Dwivedi, R.S., "Human Relations and Organisational Behaviour: A Global Perspective", MacMillan India Ltd., Delhi, 1995.

French and Bell (4th ed), "Organization Development: Behavioral Science Interventions for Organization Improvement", Prentice Hall of India Pvt. Ltd., New Delhi, 1994.

Hellriegel, Slocum and Woodman, "Organizational Behaviour", West Publishing Co. USA, 1986.

Hersey and Blanchard (6th 00), "Management of Organizational Behaviour: Utilising Human Resources", Prentice Hall of India Pvt. Ltd., New Delhi, 1996.

Prasad, Kesho, "Organisational Development for Excellence", MacMillan India Ltd., New Delhi, 1996.

Robbins (4th 00), "Essentials of Organizational Behaviour", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

Schermerhorn, Hunt and Osborw, "Managing Organization Behaviour", John Willey & Sons, USA. 1982.

Weston, Mergers, "Restructuring and Corporate Control", Prentice Hall of India Pvt. Ltd. New Delhi, 1995.

IT 51. Artificial Intelligence and Applications

Scope of AI

Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques-search knowledge, abstraction.

Problem solving

State space search: Production systems. Search space control: Depth first, breadth first search, heuristic search - Hill climbing, best first search, branch and bound. Minimax search: Alpha-Beta cut offs.

Knowledge Representation

Predicate Logic : Skolemizing queries, Unification. Modus pones. Resolution, dependency directed backtracking.

Rule Based Systems: Forward reasoning: Conflict resolution. Backward reasoning: Use of no backtrack.

Structured Knowledge Representations: Semantic Net: slots, exceptions and defaults Frmes.

Handling uncertainty

Probabilistic reasoning. Use of certainty factors, Fuzzy logic.

Handling uncertainty

Probabilistic reasoning. Use of certainty factors. Fuzzy logic.

Learning

Concept of learning, learning automation, genetic algorithm, learning by induction, neural netsback propagation.

Expert Systems

Need and justification for expert systems. Knowledge acquisition. Case studies: MYCIN, RI.

References

Nilsson, N.J., "Principles of AP', Narosa Publishing House, 1990.

Patterson, D. W., "Introduction to AI and Expert Systems", Prentice Hall of India, 1992.

Peter Jackson, "Introduction to Expert Systems", Addison Wesley Publishing Company, M.A., 1992.

Rich, E., and Knight, K., "Artificial Intelligence", Tata McGraw Hill (2nd Edition), 1992.

Schalk off, R.J., "Artificial Intelligence • An Engineering Approach", McGraw Hill International Edition, Singapore, 1992.

Sasikumar, M., Ramani, S., "Rule Based Expert System", Narosa Publishing House, 1994.

IT 52. Software Engineering II

Coding: Style of programming. Efficiency. Peer review of code. Structured Programming. Code Review.

Software Quality Assurance: Quality, Quality Plan, Quality Metric, V & V.

Testing: Software Testing. Purpose of testing. Two essential parts of testing: Test case and the expected output. How do we know we have tested enough. Test coverage. Levels of testing. Unit testing, white box testing. Domain and path testing. Equivalence class based ported testing 100% testing of simple program (6 variables and 100 paths)

Component testing. Integrated aggregate3 of few unit tested integration testing. Aggregation of components. Mismatch in assumptions between components.

System Testing, Black Box Testing, Requirements based Testing, Acceptance based testing.

Test Planning, Test Strategy, Test Coverage Planned. Test case generation, Test and output expected, Test reporting, Bug fixing.

Regression and stress testing.

Testing for performance, Security, installation recovery, configuration sensitivity.

Testing Software tools: Capture/replay. Test coverage. Test generation. Test case and report date base.

Test automation. Regression testing., Object orientation and testing, SW components.

Software Project management: Software Metrics, Estimation, Planning, SW tools, Change Management.

Software Maintenance: Maintainability, Documentation to facilitate maintenance, Regression Testing, Reverse Engineering, Legacy systems, Y2K (Year 2000 problem).

References

Beizer, B., "Software Testing Techniques". second Edition. Van Nostrand Reinhold. 1990.

IEEE Guide to Software Requirements Specifications. Std 830-1984. In IEEE Standards Collection. 1993.

Available from IEEE Standards Board. 445. Hoes Lane. P.O. Box \33 \, Piscataway. NJ 08855-1331. NJ. USA.

IEEE Standard for Software User Documentation. Std 1063-1987.

Jalote P., "An Integrated Approach to Software Engineering." Narosa 1991.

Pressman R.S .. "Software engineering· A Practitioner's Approach". Third Edition. McGraw Hill, International Edition. 1992.

Whitten. Bentley and Barlow. "System Analysis and Design Methods". Second Edition. Galgotia Publications. 1996.

MT 51. Optimization Techniques Linear Programming

Graphical method for two dimensional problems - Central problem of linear programming various definitions - statements of basic theorems and properties - Phase I and Phase II of the simplex method - revised simplex method - primal and dual - dual simplex method - sensitivity analysis transportation problem and its solution - assignment problem and its solution by Hungarian method.

Integer Programming

Gomory cutting plane methods - Branch and Bound method.

Queueing Theory

Characteristics of queueing systems - steady state MIMIt, MlMit/K and MIMIC queueing models.

Replacement Theory

replacement of items that deteriorate - Replacement of items that fail Group replacement and individual replacement.

Inventory theory

Costs involved in inventory problems - single item deterministic models-economic lot size models without shortages and with shortages having production rate infinite and finite.

PERT and CPM

Arrow networks - time estimates- earliest expected time, latest allowable occurrence time and slack - critical path - probability of meeting scheduled date of completion of project – calculations on CPM network - various floats for activities - critical path - updating project - operation time cost trade off curve - project time cost trade off curve - selection of schedule based on cost analysis.

(Remarks: No mathematical derivations included).

References

Gillet, B.E., "Introduction to Operations Research : A Computer Oriented Algorithmic Approach". Tata McGraw Hill, New York, 1990.

Gross D., and Harris. C.M .. "Fundamentals of Queueing Theory", John Wiley and Sons, New York. 1980.

Hillier F., and Lieberman. GJ., "Introduction to Operations Research", Holden Day, New York. 1985.

Karnbo, N.S., "Mathematical Programming Techniques", McGraw Hill, New York. 1985.

Kanti Swarup, Gupta, P.K., and Man Mohan, "Operations Research", Sultan Chand & Sons. New Delhi. 1990.

Mital K. V., "Optimization Methods In Operations Research and System Analysis", New Age International (P) Ltd., New Delhi, 1992.

Saffer, L.R., Fitter J.B., and MeyerW.L., "The Critical Path Method". McGraw Hill. New York. 1990.

Taha, H.A., "Operations research- An Introduction", McMillan Publishing co .• New York, 1986.

IT 11L. Information Technology Laboratory

Familiarising with PC, MS DOS and MS WINDOWS commands. File creation, editing and directory creation, Mastery of MS DOS commands, Learning to use MS office: MS WORD, use of database and spread sheet. Slide creation with Powerpoint. Use of a visual programming language such as Visual Basic.

IT 12L. Programming laboratory

Programming exercises and project using C programming language. Exercises to study various features of the language. Stress to be laid on writing well structured modular and readable programs accompanies by good documentation. Case studies of use of various data structures in applications such as sorting, searching, string manipulation and list manipulation.

IT 21L. Business Programming Laboratory

Laboratory exercises covering usage of COBOL for handling sequential, indexed sequential and random access files, report generation with COBOL. Screen management in COBOL. Exercises must be chosen to illustrate common business operations such as accounting, inventory management, personnel file manipulation and information retrieval. Some sample problems are given below:

A system for journal acquisition in a library. A bus passenger reservation systems.

An electricity billing system.

A fixed deposit accounting system for a Finance Company. Hotel room booking.

Book issues and receipts in a library;

Insurance premium calculation and issuing reminders. A hospital management system.

IT 22L. Unix and Windows Laboratory

Use of a shell script in various applications. A representative list is given in what follows:

Write a shell script that presents a multiple choice question, gets the user's answer, and reports back whether it is right or wrong. Finally it shall display the score.

Write shell script which simulates the important DOS commands with various switches.

Write a shell script that receives a file name and informs whether it exists or not. If it exists, then it shall give the details of its access permission, its size etc.

Write a shell script that accepts a matrix and finds and prints the row and column totals Modify the calendar so that it knows about weekend: On Friday, tomorrow include Saturday, Sunday and Monday, Modify calendar to handle leap years. Calendar should know about our college holidays. How would you arrange it.

Write a shell script which will accept input and then check if the input is a directory file and is readable and writeable. If so then all ordinary files under the directory should be listed out one by one and for each ordinary file that is writeable, the user should be asked if the file is to be deleted or not. If yes, then the deletion should be done else next files processed. At the end of execution of the script, should display the following messages:

i. Ordinary files deleted from the directory.
ii. Ordinary files remaining in the directory.

Write a shell script that accepts the name of a text file and finds

i. No. of sentences
ii. No. of words
iii. No. of words having more than five characters.
iv. No. of words that start with a vowel.
v. No. of articles in the text file.

2. Write a program using proper system calls to exchange data between you program and a specified file.
3. Write a Program that passes some amount of data from the client to the server using

(a) message Queues

(b) files

4. Write a program that enables you to run two or more shells on a single terminal.
5. Write a program to implement character or file I/O device driver for any device.

IT. 31L DBMS Laboratory

Study features of a commercial RDBMS package such as oracle, foxpro. MS Access and Structures query language (SQL) use with the RDBMS. Laboratory exercises should include defining scheme for applications, creation of a database, writing SQL queries to retrieve information from the database. Use of host language interface with embedded SQL. Use of forms and report writer packages available with the chosen RDBMS product. Some sample applications which may be programmed are given below:

Accounting for a shop

Database manager for a magazine agency or newspaper agency

Ticket booking for performances

Preparing greeting and birth day cards

Personal accounts - insurance, loans, mortgage payments etc.

Doctor's diary, billing

Personal bank account

Class marks management

Hostel accounting

Video tape library

History of cricket scores

Cable transmission program manager

Personal library.

MT 31L. Statistical Computing Laboratory

Computer generation of random numbers with different distributions.

Writing a questionnaire analysis program for data from surveys.

Analysis of significance of the results of survey.

Curve fitting to experimental data.

Programs to obtain frequency charts for large data sets and fitting a distribution.

Use of a statistical package to perform factor analysis and tests of significance.

IT 41L. Computer Networks Laboratory

1. Study of the operation of FSK/MSK modem by varying the data rate and measuring error rate in random noise.
2. Study of asynchronous and synchronous communication.
3. Study of the performance of Stop and Wait and sliding window protocols
4. Study of different routing protocols.
5. Study of Remote procedure call under Client-Server environment.
6. Study of different application standards in the areas of

a) file transfer access and management
b) remote logging and virtual terminals
c) E-mail systems
d) Directory services

7. Study of network performance and management using an SNMP. Compliance network managers.

IT 42L. CASE Tools Laboratory

The lab sessions will have experiments on the following:

1. CASE tools

Use of diagramming tools for system analysis, such as Turbo analyst, for preparing Data Flow diagrams and E-R diagrams. use of tools for relational database design such as relational Designer.

2. Application Development Tools:

Use of toots such as Power Builder, Delphi, Magic etc. in developing application software including interactive data-entry screens, transaction processing, report generations, etc.

3. Management Tools:

Use of tools for managing the process of software development such as Source Code Control System (SCCS), Revision Control System (RCS), Make etc.

References

Products manuals from concerned vendors

Keminghan, B.W., Pike, R., '6'fbe Unix Programming Environment", Prentice Hall of India,

New Delhi, 1984.

IT 52L. AI and Applications Laboratory

The laboratory should use languages such a PROLOG or LISP to solve the laboratory exercises. It is also suggested that an expert system shell such as IITM rule be used to create a small expert system for, say, trouble shooting moped. VCR etc. Some suggested experiments are: Tour of India, stable marriage problem, game playing (such as bridge), coin change problem etc.

MT 5IL. Optimization Techniques Laboratory

To develop computer programs for the following and to test with suitable numerical examples

1. Graphical method to solve two dimensional Linear Programming Problem.
2. Revised Simplex method to solve n-dimensional Linear Programming Problem
3. Dual Simplex method to solve n-dimensional Linear Programming Problem.
4. Solution of Transportation problem.
5. Gomory cutting plane methods for Integer Programming Problems.
6. Branch and Bound method to solve Integer Programming Problem.
7. M/M/1/N AND M/M/C queuing problems.
8. Single item deterministic inventory model problems with/without shortage and finite/infinite production rate.
9. To draw the PERT/CPM networks.
10. Calculations of PERT analysis
11. Calculation of CPM analysis.

MT 5IL. Optimization Techniques Laboratory

To develop computer programs for the following and to test with suitable numerical examples.

1. Graphical method to solve two dimensional Linear Programming Problem.
2. Revised Simplex method to solve n-dimensional Linear Programming Problem.
3. Dual Simptex method to solve n-dimensional Linear Programming Problem.
4. Solution of Transportation problem.
5. Gomory cutting plane methods for Integer Programming Problems.
6. Branch and Bound method to solve Integer programming Problem.
7. M1M/I/N AND M/M/C queuing problems.
8. Single item deterministic inventory model problems with/without shortage and finite/infinite production rate.
9. To draw the PERT/CPM networks.
10. Calculations of PERT analysis.
11. Calculation of CPM analysis.

APPENDIX B

Syllabi of Elective Subjects

IT El. Programming Languages and Paradigms

Attributes of a good language. Effects of environments. Virtual computers and binding times. syntactic elements. Stages in translation. Data types and objects.

Expression Control : Arithmetic and non arithmetic expressions. Control between statements. Sub program control: Sequence control, data control and stored data.

Procedural languages: Data objects, sequence control, subprograms and storage managements. Output-based languages: Data objects, sequence control, subprograms and storage management, abstraction and encapsulation.

Functional languages: Data objects, sequence control, subprograms and storage management Logic programming languages: Data objects, sequence control, subprograms and storage management.

References

Pratt, T.W.. et. al. "Programming Languages: Design and Implementation". 3rd edition, Prentice Hall of India. New Delhi. 1996.

IT E2. Visual Programming

C and C++ foundations Data, controls, writing and using functions. Arrays, pointers. I/O structures, unions and miscellany. Advanced C and C++ programming techniques.

Introduction to Object-Oriented programming. C++ classes. I/O. Working in object-oriented environment.

Generic concepts and tools for windows. Procedure oriented development - 16 bit applications. Object-oriented development - Foundation class library.

Windows 95 and Windows NT programming techniques.

References

Murray, el.al "The Visual C++ Handbook", 2nd edition. Osborne McGraw Hill. New York. 1996.

IT E3. Compiler Design

Classification of grammars. Context free grammars. Deterministic finite state automata (DFA) Non-DFA.

Scanners. Top down parsing, LL grammars. Bottom up parsing. Polish expressions Operator precedence grammar. IR grammars. comparison of parsing methods. Error handling.

Symbol table handling techniques. Organization for non-block and block structured languages. Run time storage administration. Static and dynamic allocation. Intermediate forms of source program. Polish N-tuple and syntax trees. Semantic analysis and code generation.

Code optimization. Folding, redundant sub-expression evaluation. Optimization within iterative loops.

References

Tremblay, et. al, "The Theory and Practice of Compiler Writing". McGraw Hill, New York, 1985.

IT E4. Advanced Unix Programming

Organisation of Unix. User interface. Programmer interface. The environment of Unix process System calls. Process control. File related system calls. Process related system calls. Signals Programming using system calls.

Advanced I/O multiplexing. Memory mapped I/O.

Interprocess communication: Pipes, shared memory, semaphores, messages.

Advanced interprocess communications. Streams. Pipes. Open server.

Reference

Stevens. W.R .. "Advanced Programming in the Unix environment". Addison Wesley. Reading. M.A .. 1992.

IT E5. Distributed Database Management

Distributed DBMS features and needs. Reference architecture. Levels of distribution transparency, replication. Distributed database design - fragmentation, allocation criteria. Storage mechanisms. Translation of global queries. /Global query optimisation. Query execution and access plan.

Concurrency control - 2 phase locks. Distributed deadlocks. Time based and quorum based protocols. Comparison. Reliability - non-blocking commitment protocols. Partitioned networks. Checkpoints and cold starts.

Management of distributed transactions - 2 phase unit protocols. Architectural aspects. Node and link failure recoveries. Distributed data dictionary management. Distributed database administration.

Heterogeneous databases-federated database, reference architecture, loosely and tightly coupled. Alternative architectures. Development tasks, Operation - global task

management. Client server databases-SQL server, open database connectivity. Constructing an application.

Reference

Ceri, S .. Pe1agatti. G., "Distributed Databases: Principles and System', McGraw Hill. New York, 1985.

IT E6. Image Processing

Image digital representation. Elements of visual perception. Sampling and quantisation. Image processing system elements.

Fourier transforms. Extension to 2· D, ocr, Walsh, Hadamard transforms.

Enhancement and segmentation: Histogram modification. Smoothing, sharpening. Thresholding. Edge detection. Segmentation. Point and region dependent techniques.

Image encoding: Fidelity criteria. Transform compression. KL, Fourier, DCT. Spatial compression, Run length coding. Huffman and contour coding.

Restoration: Models. Inverse filtering. Least squares filtering. Recursive filtering.

Reference

Gonslaez, et.a1, "Digital Image Processing", Addison Wesley, Reading, M.A., 1990.

IT E7. Parallel Programming

Processes and processors. Shared memory. Fork. Join constructs. Basic parallel programming techniques-loop splitting, spin locks, contention barriers and row conditions.

Variations in splitting, self and indirect scheduling. Data dependency-forward and backward. block scheduling.

Linear recurrence relations. backward dependency. Performance tuning overhead with number of processes, effective use of cache.

Parallel programming examples: Average, mean squared deviation, curve fitting, numerical integration, travelling salesman problem, Gaussian elimination. Discrete event time simulation.

Parallel Programming constructs in HPF, Fortran 95. Parallel programming under Unix.

References

Brawer, S., "Introduction to parallel programming", Academic Press, New York, 1989.

IT E8. Systems Analysis and Simulation

Role of Modelling in Systems Analysis: Computer Simulation of Stochastic Systems'; Generation of Pseudo-Random Numbers and Stochastic Variates using the computer; Simulation of Queuing Systems; Using special purpose languages for simulating queuing systems, GPSS and/or SLAM; System Dynamics; Simulation of Systems with Feedback; using DYNAMO in System Dynamics; Cases on Simulation in Production; Finance, Marketing, and Corporate Planning; Project Work.

References

Banks, J., Catson, S., Nelson, B.L., "Discrete-Event System Simulation", (2nd Edition). Prentice Hall of India, N. Delhi, 1996.

Deo, N., "System Simulation with Digital Computers". Prentice Hall of India, 1979.

Law, A.M., and Kelton, W.D., "Simulation Modelling and Analysis", (2nd Edition). McGraw Hill, N. Y, 1991.

8M El. Managerial Economics

Nature and scope of managerial economics. Objectives of the firm. Managerial and behavioral theories of the firm.

Concepts of opportunity cost, incremental, time perspective. Principles of discounting and equimargins. Demand analysis - purposes and concepts. Elasticity of demand. Methods of demand forecasting.

Product and cost analysis: short run and long run average cost curves.

Law of supply. Economies and diseconomies of scale. Law of variable proportions.

Production function - single output isoquants.

Pricing: Prescriptive approach. Price determination under perfect competition. Monopoly, oligopoly and monopolistic competition. Full cost pricing, product line pricing. Pricing strategies.

Profits: Nature and. measurement policy. Break-even analysis. Case study.

References

Dean. J .. "Management Economics". Prentice Hall of India, New Delhi. 1982.

Mote. V.L.. et al. "Managerial Economics: Concepts and Cases". Tata McGraw Hill. New Delhi, 1980.

BM E2. Corporate Planning

Significance of Planning: Types. Needs. Requisites. Corporate planning: system approach. Role of the planner. Corporate planning and budgeting.

Social responsibilities: Scope, contents, cooperation and society, consumers, corporation and democracy, community and government. Social responsibility versus profitability and productivity. growth. Professionalism as a means of social bahaviour.

Mission and purpose: Business definitions - objectives and goals. Environment appraisal: Concepts, components-Scanning and appraising the environment.

Organisation appraisal: Dynamics. capability factors. Considerations. Methods and techniques. Structuring. Planning gaps: Gap analysis. Manager audit: Significance of gaps.

References

Kazni. A .. "Business Policy". Tata McGraw Hill. New Delhi, 1992.

Johnson. G .. etal. 3rd edition. "Exploring corporate Strategy", Prentice Hall of India, New Delhi. 1994.

BM E3. Foundations of Decision Processes

Role of decision making in management. Framework. Criteria under conditions of certainty. risk and uncertainty. Baytes theorem. Sequential decision making decision tree analysis.

Theory of utility. Utility function curve. Competitive strategies, game theory. Queuing model. Single channel, single phase waiting line model with Poisson. Distributed arrival rates and exponentially distributed service times. Markov models.

Simulation: Monte Carlo. Application to queuing and inventory models. Applications in functional areas of marketing, production. finance. Behavioural aspects in decision making, open and closed models of decisions.

Systematic problem analysis and decision making. Decision making in functional areas - case studies.

References

Gregory, G. "Decision analysis", Pitman, London, .1988.

Johnson. R.D .. et. al. "Quantitative Techniques filr Business Decisions". Prentice Hall. N.J .. 1977.

BM E4. Investment Technology

Source of investment information.

Valuation of debt securities: Debt prices and interest rate risk. Default risk and purchasing power risk. Market interest rates and term structure of interest rates. Valuation of warrants and convertibles. Option pricing models.

Valuation of equity shares: Dividends and valuation: MMS arguments, fundamental

analysis. Earning multipliers. Timing of purchase and sale of equity shares. Estimating earnings and risk.

Portfolio theory. Efficient investments and diversification. Markowitz graphical portfolio analysis. Capital market theory. Portfolio performance evaluation - sharpe. Treynor. Jenson measures. Mutual funds - kinds and evaluation. Behaviour of share prices - technical analysis. The efficient markets. Hypothesis - random walk and Martingale methods.

References

Clark N.. et. al. "Financial Management: A Capital Market Approach". Helbrook, 1976.

Sharpe. W.F., "Investments". Prentice Hall of India. New Delhi. 1996.

BM E5. Business Finance

Financial and economic development. Intermediation, role and pallerns. Functions of money and capital markets. Interest rates, determination, term structure.

Primary capital market: new issues, growth and trends. Financial intermediaries: merchant bankers. managers, brokers, underwriters. Secondary market - organization and functioning. Trading and settlement. Problems relating to membership, commission, margins, arbitration and off-floor trading. Reforming the markets. SEBI.

Market for government securities· the discount and finance house. Operation and managerial problems of commercial banks. Inter-bank call money market. Non-banking financial institutions: lending policies, schemes, composition and quantum of assistance of IDBI. IFCI. ICICI, UTI. L1C, GlC and state level financial corporations.

Credit rating information: Parameters. Role. Agencies. CRISIL. Regulatory framework for financial markets and institutions: regulation versus deregulation. Role of RBI. Bank rate, open market operation policies.

References

Copeland, T.E., et. al, "Financial Theory and Corporate Policy". Addison Wesley, Reading, MA. 1988.

Uppal.J.S., "Public Financial Institutions in India", Mac Millan, New York, 1984.

BM E6. Taxation Practices

Assessment of undivided families: Meaning. Basic conditions. Taxable income. Partitions. Tax planning. Assessment of firms and associations: Scheme of taxation, types, treatment of losses. Tax planning.

Assessment of companies: Types, profits, depreciation, tax planning, Section 80. Bonus issues, dividend policy. Return of income and assessment procedure: Types of assessment. Time limits. Reassessment. Cooperatives.

Collection and recovery of tax: Deduction at source, rates, advance payment. Modes of recovery. Refund. Appeals and revision. Penalties.

Wealth Tax: Chargeability, valuation, return, appeals, revisions, payment and recovery, gift tax: chargeability, rebate, assessment, appeals, revisions, payment and recovery.

Central sales tax: Concept of sale and purchase. Inter-state trade. Inter-state export and import trade. State sale tax: Assessing authority. Single, multiple point tax. Procedure for registration and cancellation. Returns, payment, appeals and revisions.

References

Central and State tax acts.

Singhania, VK., **"Taxman Direct** Taxes", Taxman, New Delhi. 1996.

BM E7. MIS Frameworks and Implementation

This course will discuss a variety of frameworks for identifying information technology applications. The scope of IT applications would cover Management Information System. Decision Support System. Executive Information System and Expert System.

Provide a broad understanding of the types of the benefits information technology applications can provide in an organization through transaction processing, management and operational control, decision support systems, office automation, organizational communications and group work support.

Socio-economic environment and information systems in organization and the impact of information systems on organizations markets; frameworks for information systems planning. information systems and competitive advantage; the new strategic role of information systems: methodologies for evaluating investments in IT; frameworks and methodologies. should be discussed and illustrated with case studies.

Design of reporting system including a discussion of principles in indicator design; managing information support activity in organizations; concept of the business process re-engineering (BPR) and how IT can enable BPR.

Critical success factor in implementing IT applications including the need for managing the process of change illustrated through case studies of successful/failed IT projects. Critical role of security in implementing IT applications should be discussed.

BM E8. Management of Software Projects

Managerial Issues in Software Projects: Introduction to software markets; Planning of software projects; Size and Cost Estimations; Project Scheduling; Measurement of software quality and productivity; ISO and Capability Maturity Models for organisational growth. Project management and Practice.

Managing the systems life cycle; requirements determination, logical design, physical

design. testing, implementation; system and database integration issues; metrics for project management and systems performance evaluation, managing expectations; superiors. users. team members. and other related to the project; determining skill requirements and staffing the project; cost-effectiveness analysis; reporting and presentation techniques; and effective management of both behavioural and technical aspects of the project.

References

Gilb, T., "Principles of Software Engineering Management", Addison Weskey. Reading. M.A .• 1988.

Putnam. L.H . Myers. W., "Industrial Sire"'" Software - Effective Management using Measurement". IEEE C.S. Press. 1997.

APPENDIX C

Industry Seminar

Industry seminars are suggested to enable the students of MCA to appreciate the software development which are going on in industries in India. These seminars will help the students to face interviews with some confidence. The students should attend these and submit a report. The following points are listed to enable the college to organize these seminars.

1. Three to four organizations (Industry, Public sector organizations, Govt. organizations) are requested to present a detailed case study of one or many applications in their organization.
2. Presentation covers in detail all aspects of a project from conception to implementation and maintenance. Design is discussed to cover all factor that influenced the design. Planned and achieved benefits of the application are also stressed.
3. In order that the students take the presentations seriously, groups of students are assigned to prepare a detailed synopsis of each presentation, copies of which are distributed to others.
4. One session could be a survey of new applications in the Indian environment during the past year, as ascertained from a survey of news paper articles. This is to be done by a group of students.
5. College can invite potential employers to participate in the inauguration- and valediction of the seminar so that the efforts of the college get noticed by employers.
6. Since there are many colleges in a city with MCA, it is also appropriate to have Industry seminar on a joint basis in order to reduce the burden on the industry.
7. It is not necessary nor possible to have an examination on the seminar. Idea is that the motivated students get an opportunity to seek answers to questions on worth while computerization on our economy.
8. It is not a good idea to allow recruitment oriented presentations, which are often sales talk. without much technical value.
9. Local branch of professional societies such as Computer Society of India, IEEE, IETE etc., are usually interested in helping in the organization of such seminars.

APPENDIX D

Laboratory Infrastructure

In this appendix we give our suggestions for the laboratory infrastructure required to run effectively an MCA course. The student of MCA course requires 4 hrs, of terminal time every day inclusive of contact hours for lab instruction.

Central Computing Laboratory

These will be the main software computing labs of the department. They will support most of the Core Courses and labs in the curriculum.

These labs should have the following basic hardware equipment.

1. Novell 'Netware Server with a 50-100 User License.
2. This should at minimum be higher end Pentium or Pentium Pro-server with 32 MB RAM and 23 GB hard Disk and CD-ROM drive.
3. Three to four High End Unix Servers which can cales to
4. Each server should have at lest 128MB RAM. 4-6 GB Hard Disk Space and a SPECint92 rating of at least 250. A good option would be to run freely available LINUX OS on high end Pentium Pro based servers.
5. There should be PCs (one fo~ every student) connected to a LAN, Additional terminals are to be provided for monitoring, offsetting breakdowns and for faculty.
6. There should be at least 4 PCs with multimedia facilities connected to the LAN. 50% of the Pes with multimedia.

These computers should be connected to a Local Area Network as specified below:

1. The department should have its own LAN connecting most of the machines within the department. This includes machines in the main labs and also if possible faculty rooms, library, office etc.
2. The LAN in the department should be set-up using structured cabling such as Twisted Pair Ethernet. It should be appropriately segmented using hubs/bridges/routers. There should be provision of connecting at least 80-100 machines on the network.
3. The Department should have Internet Connection to the external world either through Satellite or Leased Line or some other means.
4. In the long run, a Campus Wide LAN should be laid down in the University Campus where the department is situated.

Software Requirements

Non-Unix Software

1. MS DOS, Windows for Workgroup. Windows 95, Windows NT:
2. Software Development Kits (for MS Windows, Novell etc.).

3. C/C++ Compilers (for e.g. Borland C++, Watcom C etc.) Pascal. Prolog and Cobol and Fortran Compilers are also recommended.

4. DBMS Software such as SYBASE, ORACLE on the Network.
5. Case Tools such as Thrbo Analyst.
6. Document Processing and Office Management tools such as MS OFFICE
7. TCP/IP Protocol Stack for DOS. Winsock for TCP/IP in MS Windows.
8. Freely available CUTCP for telnet access to servers,
9. NFS Clients on DOS such as PCNFS, XFS NFS etc.
10. Visual Basic and Visual C++ software.
11. Relevant software for use in multimedia Pes.

As some of the above packages are quite expensive, they should be prioritised keeping cost in mind. Public domain packages should be used to the extent possible. They can be modified or enhanced to suit the needs of the Labs.

UNIX Software

1. C/C+++, Pascal, Cobol, Prolog. Lisp Compilers.
2. X Windows Development Software.
3. Motif Libraries
4. Tcl- TK Programming Tools
5. Threads Programming Tools.
6. Document Processing packages such as Latex, Lyx etc.
7. Usenet News Servers and News Readers.
8. WWW - related Products (netscape, Mosaic, Lynx, Java, etc.).

Other requirements

There should also be some Peripheral Hardware available in the lab in the form of:

1. Good heavy duty printers.
2. Laser Printers
3. Plotters
4. Modems for dial up connectivity
5. UPS
6. Voltage stabilizers.
7. Backup Devices.

Space Requirements for Lab

Building space requirement can be planned in accordance with the specification of configuration as mentioned along with a hall to house 40 terminal and terminal and printers. It is suggested that there' may be separate room for graphics. DTP, etc. The space requirement may be around 150 Sq. m.

The lab should have adequate furniture. There should also be budget provision for consumables:

1. Printing Stationary such as paper, toner cartridges, ribbons etc.

2. Archival media for backups
3. Spare networking equipment and tools.

Projection Facilities

1. Overhead transparency projectors (3) (one for each lecture classroom).
2. PC based projection facilities with LCD panels to project graphics and interactive sessions using PCs.