

UNIVERSITY OF CALICUT

FACULTY OF ENGINEERING

**Curriculum, Scheme of Examinations & Syllabi for the
MASTER OF COMPUTER APPLICATION
Degree Programme
with effect from Academic Year 2001-2002**

MASTER OF COMPUTER APPLICATION

Course Structure and Scheme of Evaluation
(With effect from Academic Year 2001-2002)

IV SEMESTER:

Course No	Course Title	Hours Per Week			University Exam		Sessional Marks	Total Marks
		L	T	P	Duration (Hrs)	Marks		
MCA2K 401	Computer Architecture	3	1	0	3	100	50	150
MCA2K 402	Accounting and Financial Management	3	1	0	3	100	50	150
MCA2K 403	Data Communication & Computer Networks	3	1	0	3	100	50	150
MCA2K 404	Elective I	3	1	0	3	100	50	150
MCA2K 405	Elective II	3	1	0	3	100	50	150
MCA2K 406P	System Software Lab	0	0	3	--	--	50	50
Total		15	5	3		500	300	800

Electives:

- MCA2K 404 A - Artificial Intelligence
- MCA2K 404 B - Image Processing
- MCA2K 404 C - Advanced Database Management Systems
- MCA2K 405 A - Algorithm Analysis & Design
- MCA2K 405 B - Simulation & Modeling
- MCA2K 405 C - C Object Oriented Programming Structures
- MCA2K 405 D - Communication Systems

MCA2K 401 : COMPUTER ARCHITECTURE

3 hours lecture and 1 hour tutorial per week

Module I (7 hours)

Fundamentals - task of a computer designer - trends in technology usage and cost - performance measurement - quantitative principles of computer design - instruction set architectures - classification - addressing and operations - encoding an instruction set - role of compilers

Module II (8 hours)

Case study: the DLX architecture - pipelining - pipeline for DLX - pipeline hazards - data and control hazards - implementation difficulties - pipelining with multicycle operations

Module II (12 hours)

Instruction level parallelism - concepts and challenges - dynamic scheduling - dynamic hardware prediction - multiple issue of instructions - compiler and hardware support for ILP - vector processing - vector architecture - vector length and stride - compiler vectorization - enhancing vector performance

Module IV (13 hours)

Memory hierarchy design - reducing cache misses and miss penalty, reducing hit time - main memory virtual memory and its protection - case study - protection in the intel pentium - crosscutting issues - I/O systems - performance measures - reliability and availability - designing an I/O system - case study - unix file system performance

Module V (12 hours)

Interconnection networks - simple networks - connecting more than two computers - practical issues - multiprocessors - introduction - application domains - centralised-shared memory and distributed-shared memory architectures - synchronization - models of memory consistency

Text book

Hennesy J.L. & Pattersen D.A., *Computer Architecture: A Quantitative Approach*, Harcourt Asia Pte Ltd. (Morgan Kaufman)

Reference books

1. Pattersen D.A. & Hennesy J.L., *Computer Organization And Design: The Hardware/ Software Interface*, Harcourt Asia Pte Ltd (Morgan Kaufman)
2. Hwang K., *Advanced Computer Architecture: Parallelism, Scalability And Programmability*, McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 402 : ACCOUNTING AND FINANCIAL MANAGEMENT

3 hours lecture and 1 hour tutorial per week

Module I: (10 hours)

Financial Accounting: Finance function in an organization, accounting transactions, principles, recording, classification, summarization, preparation of profit and loss, balance sheet statements, role of computers/soft wares in financial accounting.

Module II: (12 hours)

Financial Analysis: time value of money, net present value, annuities, sources of corporate finance – short term and long term, ratio analysis, types of ratios, importance, limitations, statement of changes in financial position, funds flow and cash analysis.

Module III: (10 hours)

Cost concepts: cost terms, elements of cost, cost sheet, CVP analysis, marginal costing, relevant costs in decisions like make or buy, alternate methods of production, replacement of asset, continuation Vs discontinuation of decision, limitations of costing/cost concept.

Module IV: (10 hours)

Budgetary Control: need, importance, classification, preparation of class budget, zero based budgets.
Working Capital management: meaning, types, operating cycle, determinants of working capital, computation of working capital, sources of finance for working capital.

Module V: (13 hours)

Capital budgeting: nature, cash flows, techniques, traditional and DCF techniques, comparison of NPV and IRR.
Capital Market, investment scene, stock exchanges, equity, depth, mutual fund market, credit rating, SEBI

Text book

1. Finance and Accounting for Managerial Competitiveness- Dhameja N & Sastry K. Wheeler Pub.

Reference books

1. Financial accounting – Jawaharlal 2nd edition, TMH
2. Cost accounting – Jawaharlal, 2nd edition, TMH
3. Financial Management – KHAN M Y & Jain P K , 3rd ed, TMH
4. Management Accounting - - KHAN M Y & Jain P K , 3rd ed, TMH
5. Modern Corporate Finance- Alan C Shapiro, Maxwell MacMillan

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 403 : DATA COMMUNICATION & COMPUTER NETWORKS

3 hours lecture and 1 hour tutorial per week

Module I: (9 hours)

Introduction: networks, protocols and standards, standards organizations. Basic concepts: line configuration, topology, transmission mode, classifications. OSI Model: functions of the layers. Signals: analog and digital signals, mathematical approach. Encoding: D to D, A to D, D to A, A to A encodings.

Module II: (9 hours)

Data transmission: digital data transmission, DTE-DCE interface, other interface standards, modems. Transmission media: guided media, unguided media, performance. Multiplexing: types, applications, the telephone system.

Module III: (9 hours)

Error Control: types of errors, error detection, error correction. Data Link Control: line discipline, flow control, error control. Data Link Protocols: asynchronous and synchronous protocols, character oriented protocols, bit-oriented protocols.

Module IV: (13 hours)

LANs: Project 802, Ethernet, token bus, FDDI, comparison. MANs: IEEE 802.6, SMDS. Switching: Circuit switching, packet switching, message switching, network layer. ISDN: Services, history, subscriber access, ISDN layers, BISDN. X.25: X.25 Layers, packet layer protocol. Frame Relay: layers, operation, implementation. ATM: design goals, topology, protocol architecture.

Module V: (12 hours)

SONET: Physical configuration, layers, SONET frame. Networking devices: Repeaters, bridges, routers, gateways, routing algorithms. Transport layer: duties, connection, transport protocol. Upper OSI Layers: Session layer, presentation layer, application layer. TCP/IP: network layer protocols, transport layer protocols, application layer protocols, WWW.

Text book

1. B Forouzan, Introduction to Data Communication and Networking, Tata McGraw Hill

Reference books

1. F Halsall, Data Communication, Computer Networks and open Systems
2. LL Peterson and BS Davie, Computer Networks, A system Approach 2nd Ed, Harcourt Asia
3. Andrew S Tanenbaum, Computer Networks, PHI 3rd Ed

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 404A : ARTIFICIAL INTELLIGENCE

3 hours lecture and 1 hour tutorial per week

Module I (16 hours)

Introduction - definition and basic concepts - aims - approaches - problems in AI - AI applications - perception and action - representing and implementing action functions - production systems - networks - problem solving methods - forward versus backward reasoning - search in state spaces - state space graphs - uninformed search - breadth first search - depth first search - heuristic search - using evaluation functions - general graph-searching algorithm - algorithm A* - admissibility of A* - the consistency condition - iterative deepening A* - algorithm AO* - heuristic functions and search efficiency - alternative search formulations and applications - assignment problems - constraint satisfaction - heuristic repair - two agent games - the mini-max search - alpha beta procedure - games of chance

Module II (6 hours)

Knowledge representation - the propositional calculus - using constraints on feature values - the language - rules of inference - definition of proof - semantics - soundness and completeness - the PSAT problem - meta-theorems - associative and distributive laws - resolution in propositional calculus - soundness of resolution - converting arbitrary wffs to conjunctions of clauses - resolution refutations - horn clauses T

Module III (8 hours)

The predicate calculus - motivation - the language and its syntax - semantics - quantification - semantics of quantifiers - resolution in predicate calculus - unification - converting arbitrary wffs to clause form - using resolution to prove theorems - answer extraction - knowledge representation by networks - taxonomic knowledge - semantic networks - frames - scripts

Module IV (12 hours)

Neural networks - introduction - motivation - notation - the back propagation method - generalisation and accuracy - reasoning with uncertain information - review of probability theory - probabilistic inference - bayes networks - genetic programming - program representation in GP - the GP process - communication and integration - interacting agents - a modal logic of knowledge - communication among agents - speech acts - understanding language strings - efficient communication - natural language processing - knowledge based systems - reasoning with horn clauses - rule based expert systems

Module V (10 hours)

Programming in LISP - basic LISP primitives - definitions - Predicates - conditionals - and Binding - recursion and iteration - association lists - properties and data abstraction - lambda expressions - macros - I/O in LISP - examples involving arrays and search

Text book

Nilsson N.J., *Artificial Intelligence - A New Synthesis*, Harcourt Asia Pte. Ltd.

Reference books

6. Luger G.F. & Stubblefield W.A., *Artificial Intelligence*, Addison Wesley
7. Elaine Rich & Kevin Knight, *Artificial Intelligence*, Tata McGraw Hill
8. Tanimotto S.L., *The Elements of Artificial Intelligence*, Computer Science Press
9. Winston P.H., *LISP*, Addison Wesley

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 404B : IMAGE PROCESSING

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - digital image fundamentals - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry I

Module II (10 hours)

Image transforms - introduction to Fourier transform - discrete Fourier transform - some properties of 2-D Fourier transform (DFT) - the FFT - other separable image transforms - Hotelling transform

Module III (12 hours)

Image enhancement - point processing - spatial filtering - frequency domain - color image processing - image restoration - degradation model - diagonalization of circulant and block circulant matrices - inverse filtering - least mean square filter

Module IV (10 hours)

Image compression - image compression models - elements of information theory - error-free compression - lossy compression - image compression standards

Module V (10 hours)

Image reconstruction from projections - basics of projection - parallel beam and fan beam projection - method of generating projections - Fourier slice theorem - filtered back projection algorithms - testing back projection algorithms

Text book

Rafael C., Gonzalez & Woods R.E., *Digital Image Processing*, Addison Wesley

Reference books

1. Rosenfeld A. & Kak A.C., *Digital Picture Processing*, Academic Press
2. Jain A.K., *Fundamentals of Digital Image Processing*, Prentice Hall, Englewood Cliffs
3. Schalkoff R. J., *Digital Image Processing and Computer Vision*, John Wiley
4. Pratt W.K., *Digital Image Processing*, John Wiley

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA 404C : ADVANCED DATABASE MANAGEMENT SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (11 hours)

Overview of relational database concept - object oriented database - overview of object oriented concepts - object definition language - object query languages - object database conceptual design - overview of CORBA standard for distributed objects

Module II (13 hours)

Distributed database concepts - data fragmentation replication and allocation - types of distributed database system - query process - concurrency control for distributed database - overview of client - server architecture and its relationship to distributed database

Module III (8 hours)

Deductive database - introduction to deduction database prolog/datalog notation - interpretation of rules - basic inference mechanism for logic programs - datalog programs and their evaluation - deduction database systems

Module IV (8 hours)

Dataware housing and data mining - database on World Wide Web - multimedia database - mobile database - geographic information system - digital libraries

Module V (12 hours)

Oracle and microsoft access - basic structure of the oracle system m database structures and its manipulation in oracle - storage organization programming oracle applications - oracle tools - an overview of microsoft access features and functionality of access - distributed databases in oracle

Text book

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Addison Wesley

Reference books

1. Ramakrishnan R. & Gehrke J., *Database Management Systems*, McGraw Hill
2. O'neil P. & O'neil E., *Database Principles, Programming, and Performance*, Harcourt Asia (Morgan Kaufman)
3. Silberschatz, Korth H.F. & Sudarshan S., *Database System Concepts*, Tata McGraw Hill
4. Theory T.J., *Database Modelling and Design*, Harcourt Asia (Morgan Kaufman)

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 405A : DESIGN & ANALYSIS OF ALGORITHMS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Analysis: RAM model - cost estimation based on key operations - big Oh - big omega - little Oh - little omega and theta notations - recurrence analysis - master's theorem - solution to recurrence relations with full history probabilistic analysis - linearity of expectations - worst and average case analysis of quick-sort - merge-sort - heap-sort - binary search - hashing algorithms - lower bound proofs for the above problems - amortized analysis - aggregate - accounting and potential methods - analysis of Knuth-Morris-Pratt algorithm - amortized weight balanced trees

Module II (13 hours)

Design: divide and conquer - Strassen's algorithm - $o(n)$ median finding algorithm - dynamic programming - matrix chain multiplication - optimal polygon triangulation - optimal binary search trees - Floyd-Warshall algorithm - CYK algorithm - greedy - Huffman coding - Knapsack, Kruskal's and Prim's algorithms for MST - backtracking - branch and bound - traveling salesman problem.

Module III (13 hours)

Complexity: complexity classes - P, NP, Co-NP, NP-Hard and NP-complete problems - cook's theorem (proof not expected) - NP-completeness reductions for clique - vertex cover - subset sum - Hamiltonian cycle - TSP - integer programming - approximation algorithms - vertex cover - TSP - set covering and subset sum

Module IV (7 hours)

Introduction to parallel systems: PRAM models – EREW, ERCW, CREW and CRCW- relation between various models – handling read write conflicts – work efficiency – Brent's theorem

Module V (6 hours)

Parallel merging, sorting and connected components, list rank, Euler tour technique, parallel prefix computation, deterministic symmetry breaking

Text books

1. Corman T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms*, Prentice Hall India, Modules I, II & III
2. Motwani R. & Raghavan P., *Randomized Algorithms*, Cambridge University Press, Module IV

Reference books

1. Basse S., *Computer Algorithms: Introduction to Design and Analysis*, Addison Wesley
2. Manber U., *Introduction to Algorithms: A Creative Approach*, Addison Wesley
3. Aho V., Hopcraft J.E. & Ullman J.D., *The Design and Analysis of Computer Algorithms*, Addison Wesley

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 405B : SIMULATION & MODELLING

3 hours lecture and 1 hour tutorial per week

Module I (6 hours)

Introduction - systems and models - computer simulation and its applications - continuous system simulation - modelling continuous systems - simulation of continuous systems - discrete system simulation - methodology - event scheduling and process interaction approaches

Module II (6 hours)

Random number generation - testing of randomness - generation of stochastic variates - random samples from continuous distributions - uniform distribution - exponential distribution m-Erlang distribution - gamma distribution - normal distribution - beta distribution - random samples from discrete distributions - Bernoulli - discrete uniform - binomial - geometric and poisson

Module III (12 hours)

Evaluation of simulation experiments - verification and validation of simulation experiments - statistical reliability in evaluating simulation experiments - confidence intervals for terminating simulation runs - simulation languages - programming considerations - general features of GPSS - SIM SCRIPT and SIMULA

Module IV (15 hours)

Simulation of queueing systems - parameters of queue - formulation of queueing problems - generation of arrival pattern - generation of service patterns - Simulation of single server queues - simulation of multiserver queues - simulation of tandem queues

Module V (15 hours)

Simulation of stochastic network - simulation of PERT network - definition of network diagrams - forward pass computation - simulation of forward pass - backward pass computations - simulation of backward pass - determination of float and slack times determination of critical path - simulation of complete network - merits of simulation of stochastic networks

Note to the question paper setter - programming questions must be based on `C` language or specified simulation languages in the syllabus.

Reference books

1. Deo N., *System Simulation and Digital Computer*, Prentice Hall of India.
2. Gordan G., *System Simulation*, Prentice Hall of India.
3. Law A.M. & Ketton W.D., *Simulation Modelling And Analysis*, McGraw Hill.

Sessional work assessment

Assignments* 2x10 = 20

2 Tests** 2x15 = 30

Total marks = 50

* One assignment must be computer based. (Practical)

** One Sessional test must be computer based. (Practical)

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 405C : OBJECT ORIENTED PROGRAMMING STRUCTURES

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

OOPS and Java basics - Java virtual machine - Java platform API - extended security model - applet classes - exceptions and abstract classes - Java applet writing basics - GUI building with canvas - applet security - creating window applications - writing console applications - utility and math packages

Module II (10 hours)

Swing programming - working with swing components - using the clipboard - input/output streams - printing - working with 2D and 3D Graphics - using audio and video - creating animations

Module III (10 hours)

Java beans development kit - developing beans - notable beans - network programming - client and server Programs - naming and directory services - working with Java management APIS

Module IV (10 hours)

Distributed application architecture - CORBA - RMI and distributed applications - working with remote objects - object serialization and Javaspaces - Java IDL and ORBs

Module IV (10 hours)

Connecting to database - using JDBC - integrating database - support into web applications - Java servlets - JSDK - JAR files - Java native interface

Text books

1. Campione, Walrath & Huml Tutorial team, “*The Java Tutorial Continued: The Rest of the JDK*”, Addison Wesley
2. Jamie Jaworski, “*Java 2 Platform Unleashed: The Comprehensive Solution*”, SAMS Techmedia

References books

1. Holzner S., *Java 2, Swings, Servlets, JDBC & Java Beans Programming*, IDG Books
2. Campione M. & Walrath K. “ *The Java Tutorial: Object-Oriented Programming For The Internet*”, Addison Wesley
3. Patrick N. & Schildt H., “*Java 2: The Complete Reference*, Tata McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA2K 405D : COMMUNICATION SYSTEMS

3 hours lecture and 1 hour tutorial per week
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Module I (14 hours)

Noise in communication systems - classification - SNR - CNR - noise figure - relationships between noise figures - voice signal digitization - PAM - PPM - PWM - PCM - delta modulation - PCM and DM voice signal comparison - TDM of PCM signals - CCITT - digital radio - block diagram - ASK - FSK - PSK - QAM - digital demodulation - QAM demodulation

Module II (12 hours)

Line-of sight microwave links - analog line of sight microwave links - digital line of sight microwave links - communication satellites - classification - communication satellite systems - orbits - planetary mechanics - launching - stabilization - subsystems and repeaters

Module III (13 hours)

Satellite earth stations - antenna subsystems - transmitter - receiver
Satellite access - FDM access - TDM access - satellite links - satellite link analysis and design - digital satellite link design

Module IV (13 hours)

Fiber optic communications - nature of light - optical laws - optical fibres - optical sources - photo detection - optical communication systems - system parameters - analog optical fibre links - digital optical fiber systems

Module IV (13 hours)

System measurements - Fourier series - the Z-transform - modulator/demodulator sensitivity measurements - digital microwave link measurements and performance evaluation - high definition TV - system specifications

Text book

Kolimbiris H., *Digital Communication Systems*, Pearson Education Asia

Reference books

1. Freeman R.L., *Tele Communication Transmission Hand book*, Wiley
2. Panther P.F., *Communication System Design*, McGraw Hill
3. Ramaswami R. & Sivarajan K. N., *Optical Networks*, Harcourt Asia
4. Gagliardi R.M., *Satellite Communications*, CBS Publishers
5. Gowar, *Optical Communications*, PHI

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Seven questions covering all the five modules. Each carries 20 marks. There should be a minimum of one question from each module. There should not be more than two questions from any module. The student has to answer any five full questions for scoring full marks.

MCA 406(P) : COMPILER LAB

3 hours practical per week

Compilers

- 1 : Generation of lexical analyzer using tools such as LEX.
- 2 : Generation of parser using tools such as YACC.
- 3 : Creation of Symbol tables.
- 4 : Creation of type checker.
- 5 : Generation of intermediate code.

Operating Systems

1. Implementation of Dining philosophers problem by multiprogramming using threads, semaphores and shared memory
2. Implement ls/dir commands of Unix /Dos to display contents of a given floppy disk
3. Program to generate disk usage status report for a given Unix/Dos formatted floppy disk giving details like free space availability etc..
4. Implement Bankers algorithm
5. Inter-process communication using Mailboxes and pipes

Reference books

1. Gary J Nutt, "Operating Systems-A modern Perspective", Addison Wesley.
2. M.J. Bach, "The design of the Unix Operating System", Prentice Hall
3. Aho A V, Sethi R and Ullman J D,"Compiler Principles",
4. Aho AV and Ullman JD,"Principles of Compiler Design", Narosa

Sessional work assessment

Laboratory practicals and record	=30
Tests	=20
Total marks	=50