U.P. TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

2nd year [III & IV Sem.]

[Effective from the session : 2009-10]

MASTER OF COMPUTER APPLICATION
# U.P. TECHNICAL UNIVERSITY, LUCKNOW

## STUDY AND EVALUATION SCHEME

**MCA (Master of Computer Application)**

(Effective from the session: 2009-10)

### MCA YEAR II, SEMESTER – III

#### EVALUATION SCHEME

<table>
<thead>
<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
<th>SUBJECT</th>
<th>PERIODS</th>
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#### PRACTICALS

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### MCA YEAR – II, SEMESTER – IV

#### EVALUATION SCHEME

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#### Code List of Elective-I

- MCAE11 Compiler Design
- MCAE12 Client Server Computing
- MCAE13 Data Warehousing & Mining
- MCAE14 Cryptography & Network Security
- MCAE15 Theory of Automata & Formal Languages
- MCAE16 Distributed system

(2)
## U.P. TECHNICAL UNIVERSITY, LUCKNOW

**STUDY AND EVALUATION SCHEME**

**MCA (Master of Computer Application)**  
(Effective from the session: 2010-11)

### MCA YEAR III, SEMESTER – V

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**Total** 15 5 6 1000

### List

**Elective-II**

- MCAE21 Computer Graphics & Animation
- MCAE22 Simulation & Modelling
- MCAE23 Advance Database Management Systems
- MCAE24 Artificial Intelligence
- MCAE25 Information Security & Cyber Laws
- MCAE26 Information Storage & Management

**Elective-III**

- MCAE31 ERP Systems
- MCAE32 Software Project Management
- MCAE33 Real Time Systems
- MCAE34 Mobile Computing
- MCAE35 Neural Networks
- MCAE36 Pattern Recognition

### YEAR –III, SEMESTER – VI

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**Total** 1000
OPERATING SYSTEMS
MCA 311
L T P 3 1 0

Unit-I
Introduction: Definition and types of operating systems, Batch Systems, multi programming, time-sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

Unit-II
Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

Unit-III

Unit-IV

Unit-V
Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security

References
3. Harvey M Deital, "Operating Systems”, Addison Wesley

DESIGN AND ANALYSIS OF ALGORITHMS
MCA 312
L T P 3 1 0

Unit-I
Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort
Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics

Unit-II
Advanced Data Structure: Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, Dictionaries and priority Queues, mergeable heaps, concatenateable queues

Unit-III
Advanced Design and Analysis Techniques: Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis

Unit-IV
Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal’s Algorithms, Prim’s Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

Unit-V

References
DATABASE MANAGEMENT SYSTEMS
MCA 313
L T P
3 1 0

Unit-I
Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure.

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit-II
Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.

PL/SQL, Triggers and clusters.

Unit-III
Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV

Unit-V
Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

References
1. Date C J, “An Introduction To Database System”, Addision Wesley

INTERNET & JAVA PROGRAMMING
MCA 314
L T P
3 1 0

Unit-I
Internet: Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

Unit-II

Unit-III

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating
through multiple rows retrieved from a database.

Unit IV

**Java Beans:** Application Builder tools, The bean developer kit (BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),

**Introduction to RMI (Remote Method Invocation):** A simple client-server application using RMI.

Unit V

**Java Servlets:** Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

**References:**
1. Margaret Levine Young, “The Complete Reference Internet”, TMH
2. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
3. Balagurusamy E, “Programming in JAVA”, TMH
4. Dustin R. Callway, “Inside Servlets”, Addison Wesley
2. Write Programs in PL/SQL, Understanding the concept of Cursors.
3. Write Program for Join, Union & intersection etc.
5. Creating Forms, Reports etc.
6. Writing codes for generating read and update operator in a transaction using different situations.
8. Developing code for understanding of distributed transaction processing.

Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software’s students may use power builder/SQL Server/DB2 etc. for implementation.

Java Programming Lab

MCA-352

1. Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.
2. Write programs to create packages and multiple threads in Java.
3. Write programs in Java for event handling Mouse and Keyboard events.
4. Using Layout Manager create different applications.
5. Write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.
6. Using Java create Applets.
8. Write a program in java to read data from disk file.

MANAGEMENT INFORMATION SYSTEMS

MCA 411

Unit 1: Foundation of Information Systems: Introduction to information system in business, fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.

Unit 2: An overview of Management Information Systems: Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Concept of an MIS, Structure of a Management information system.


Unit 5: Managing Information Technology: Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes.


Text Books

1. O Brian, “Management Information System”, TMH
2. Gordon B. Davis & Margrethe H. Olson, “Management Information System”, TMH.

References

1. O Brian, “Introduction to Information System”, MCGRAW HILL.
4. Jain Sarika, “Information System”, PPM
5. Davis, “Information System”, Palgrave Macmillan
Unit – I
Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints.

Unit – II
Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

Unit – III
Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

Unit – IV


Unit – V
Software Development using Java:
Java Beans, Java Swing, Java Servlets, Migrating from C++ to java, Application of java, Dynamic Billboard Applet, Image Menu: An image based menu, Lavatron Applets, Scrabbllets, JDBC, Brief functioning of upper layer E-mail and their applications.

Text Books:
3. E. Balagurusamy, “Programming in JAVA”, TMH.

References:
2. Bjarne Stroustrup, “C++ Programming Language”, Addison Wesley

FOUNDAMENTALS OF E-COMMERCE
MCA 413

Unit 1

Network Infrastructure for E-Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Unit II

Unit III

Unit IV
Encryption: Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit V
Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.
EDI Application in business, E-Commerce Law, Forms of Agreement, Govt. policies and Agenda.
References
2. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH

MCA-414 : COMPUTER NETWORKS

Unit-I
Introductory Concepts: Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, Integrated services digital networks, terminal handling.

Unit-II
Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, Ethernet, FDDI, Data Link Layer- basic design issues, error correction & detection algorithms, elementary data link layer protocols, sliding window protocols, error handling, High Level Data Link Control

Unit-III

Unit-IV

Unit-V
Application Layer: Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Introduction to Cryptography and Network Security (DES, RSA algorithms), Communication Security (IPSec, Firewalls), Authentication protocols such as authentication based on shared key (Diffie Hellemann Key exchanger), Introduction to multimedia and compression Techniques.

References
3. Computer Networks & Internet with Internet Applications by Comer Pearson Education
4. Internetworking with TCP/IP by PHI
5. Data Communication and Networking by Forouzan TMH
6. Computer Networks with Internet Protocols by W Stallings, Pearson Education
7. Local and Metropolitan Area Networks by W Stallings, VIth edition, Pearson Education

MCA-451 : OBJECT ORIENTED SYSTEMS LAB

Experiments based on the course Object Oriented Systems to be done on C++/JAVA/UML/VISIO etc.

MCA- E11 : COMPILER DESIGN

Unit-I
Compiler Structure: Compilers and Translators, Various Phases of Compiler, Pass Structure of Compiler, Bootstrapping of Compiler
Programming Languages: High level languages, The lexical and syntactic structure of a language, Data elements, Data Structure, Operations, Assignments, Program unit, Data Environments, Parameter Transmission.
Lexical Analysis: The role of Lexical Analyzer, A simple approach to the design of Lexical Analyzer, Regular Expressions, Transition Diagrams, Finite state Machines, Implementation of Lexical Analyzer, Lexical
Analyzer Generator: LEX, Capabilities of Lexical Analyzer

Unit II
The Syntactic Specification of Programming Languages: CFG, Derivation and Parse tree, Ambiguity, Capabilities of CFG.
Basic Parsing Techniques: Top-Down parsers with backtracking, Recursive Descent Parsers, Predictive Parsers, Bottom–up Parsers, Shift-Reduce Parsing, Operator Precedence Parsers, LR parsers (SLR, Canonical LR, LALR)
Syntax Analyzer Generator: YACC

Unit III
Intermediate Code Generation: Different Intermediate forms: three address code, Quadruples & Triples. Syntax Directed translation mechanism and attributed definition.
Translation of Declaration, Assignment, Control flow, Boolean expression, Array References in arithmetic expressions, procedure calls, case statements, postfix translation.

Unit IV
Run Time Memory Management: Static and Dynamic storage allocation, stack based memory allocation schemes, Symbol Table management
Error Detection and Recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

Code Optimization and Code Generation: Local optimization, Loop optimization, Peephole optimization, Basic blocks and flow graphs, DAG, Data flow analyzer, Machine Model, Order of evaluation, Register allocation and code selection

References:

MCA-E12 : CLIENT SERVER COMPUTING

L T P
3 1 0

Unit I
Client/Server Computing: DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

Unit II
Components of Client/Server application: The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).
The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

Unit III
Client/Server Network: connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

Unit IV
Data Storage: magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards.
Network protection devices, Power Protection Devices, UPS, Surge protectors.


Unit V
Client/Server System Development: Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.
The future of client server Computing Enabling Technologies, The transformational system.

References:
2. Dawna Travis Dewire, “Client/Server Computing”, TMH
MCA-E13 : DATA WAREHOUSING & MINING

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V

References:
1. Berson, “Data Warehousing, Data-Mining & OLAP”. TMH
5. Margaret H. Dunham, “Data-Mining. Introductory & Advanced Topics”, Pearson Education

MCA-E14 : CRYPTOGRAPHY AND NETWORK SECURITY

Unit-I

Unit-II

Unit-III

Unit-IV

Unit-V

Text Book:

Reference Books:
MCA-E15 : THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I
Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

Unit – II
Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III
Context free grammar (CFG) and Context Freee Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs,

Unit – IV
Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V
Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

Text Books and References:
1. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education
3. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH

MCA-E16 : DISTRIBUTED SYSTEM

Unit-1
Introduction to Distributed Data system, Distributed Database Architecture, Distributed Data base Design, Transaction processing Concurrency Control techniques, Security.

Unit-2
Types of Data Fragmentations, Fragmentation and allocation of fragments, Distribution transparency, access primitives, integrity constraints.
Unit-3
Grouping and aggregate function, Query processing, Equivalence transformation of queries.

Unit-4
Evaluation, parametric queries, Query optimization, Join and general queries.

Unit-5
**Management of Distributed transaction and concurrency control:** Distributed Data base Administration, Catalogue Management Authorisation, Security and protection. Examples of distributed database systems. Cost Analysis

References: