MCA 3rd SEMESTER SYLLABUS
DEPARTMENT OF COMPUTER SCIENCE & IT
COTTON UNIVERSITY

PAPER: MCA901C

OPERATING SYSTEM

(Credits: 3+1+0=4)

UNIT I: Introduction [4 Lectures]
Operating systems overview: Operating systems as an extended machine & resource manager, operating systems classification; Operating systems and system calls; Operating systems architecture.

UNIT II: Processes [4 Lectures]
Process Concept, Thread, design issues of thread, user space thread and kernel space thread; Usage of thread; Process states, Operation on Processes - creation and termination. Implementation of process - process table

UNIT III: Process Synchronization [6 Lectures]
Race condition, Critical-Section, mutual exclusion. Solution to race condition and synchronization: - disabling interrupt, test-and-set-lock, Peterson's solution, semaphore, mutex, monitor, message passing;

UNIT IV: Scheduling [8 Lectures]
Basic concepts, preemptive and non-preemptive scheduling, scheduling algorithms; types of scheduling- batch, interactive and real-time; goals of scheduling algorithms. FCFS, SJF, RR, priority, multiple queues, and three-level scheduling.

UNIT V: Deadlocks [6 Lectures]
System model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock; banker's algorithm

UNIT VI: Memory management [8 Lectures]
Multiprogramming, address binding (relocation) and protection. swapping, virtual memory - logical versus physical address space,paging, page fault, page table and its entries, demand paging, multi-level page table, TLB, its entries and working; Page replacement algorithms - LRU, optimal, NRU, FIFO, second chance, clock, NFU; Working set; What is segmentation, what are its benefits and drawbacks

UNIT VII: File system [6 Lectures]
What is file, file naming, file types(directory, regular, device), sequential access and random access files, file attributes, operations on file, hierarchical directory structure, path name(relative and absolute), operation on directories, disk layout, disk partition, file system layout, disk block allocation-contiguous allocation linked list allocation, FAT, i-nodes, directories in UNIX, file system security; A Simple File System; General Model of a File System; Case study on DOS, Windows 98, Windows NT & Linux.

UNIT VIII: I/O management [6 Lectures]
Basic principles and overall structure of I/O management subsystem, Device controllers, layers of the I/O subsystem - interrupt handlers device driver, device independent I/O software and user space I/O software

Textbooks:
1.Modern Operating System, Tanenbaum, PHI Publication.

Recommended Books:
1.Operating System by Galvin
2.G. Nutt Operating Systems: A Modern Perspective, Pearson Education.
3.W. Stallings Operating Systems, Prentice Hall of India.
4.Peterson, "Operating System".

****

PAPER: MCA902C

DATA MANAGEMENT SYSTEM

(Credits: 3+1+0=4)

UNIT I: Basic Concepts [6 Lectures]
Data modeling for a database, abstraction and data integration, three level architecture of a DBMS, overview of relational, network and hierarchical data models. Overview of DBMS software framework: MySql, Oracle.

UNIT II: Database Design [8 Lectures]
Entity Relationship model, Extended Entity Relationship model. Relation, integrity constraints, relational algebra, relational domain & tuple calculus, conversion of ER diagrams to relations.

UNIT III: Structured Query Language [8 Lectures]
DDL, DML, Views, Embedded SQL.

UNIT IV: NoSQL and Multi-Model Databases [5 Lectures]
Definition of NoSQL, History of NoSQL and Different NoSQL products,NoSQL Storage Architecture. Defination of Multi Model DB. Multi Model DB architecture.

UNIT V: Relational Database Design Concepts [8 Lectures]
Functional dependencies, determining keys; normalization – 1st, 2nd, 3rd, BCNF, 4th and 5th normal forms, lossless join and dependency preserving decomposition.

UNIT VI: Transaction Processing concepts [8 Lectures]
Transactions, Serializability, Concurrency Control Techniques, locking protocols, 2PL, Timestamp based protocols.
Recovery Techniques and protocols. Brief overview of object relational databases, client-server models, distributed databases, Spatial and temporal databases, deductive databases, multimedia databases.

UNIT VII: Database storage structures [5 Lectures]
Indexing, hashing and grid files.

Textbooks:
1. Silberschatz, H. Korth and S. Sudarshan: Database System Concepts, McGraw Hill

Recommended Books:
1. R. Elmasri and S. B. Navathe: Fundamentals of Database Systems, Addison Wesley
2. R. Ramakrishnan and J. Gehrke: Database Management Systems, McGraw Hill,
3. P. Rob and C. Coronel: Database Systems: Design, Implementation, and Management, Thomson Learning

****

PAPER: MCA903C

DESIGN AND ANALYSIS OF ALGORITHMS

(Credits: 3+1+0=4)

UNIT I: Complexity Notations [8 Lectures]
Algorithm, analysis, time and space complexity, O-notation, omega notation and theta notation, sets and disjoint set, union and find algorithms, RAM model, O(log n) bit model

UNIT II: Algorithm Design Techniques: overview [4 Lectures]
Brief overview,Iterative techniques, overview of sorting and searching.

UNIT III: Divide and conquer [10 Lectures]
Binary search, quick sort, heap sort, merge sort, Search Trees, complexity analysis of sorting algorithms.

UNIT IV: Graphs [4 Lectures]
Graph: definition, graph algorithms: depth-first search vs breath first search ,applications, minimum spanning trees and shortest paths.

UNIT V:Greedy Algorithms [8 Lectures]
Interval scheduling, Huffman coding, knapsack problem, job sequencing with deadlines, optimal merge patterns, minimal spanning trees and dijkstra's algorithm.

UNIT VI:Dynamic programming [8 Lectures]
memorization, 0/1 knapsack problem, longest ascending subsequence, matrix multiplication, shortest paths: Bellman Ford, Floyd Warshall.

UNIT VII: Backtracking [4 Lectures]
Backtracking and branch and bound, traveling salesman problem, 8 queen's problem, graph coloring, hamiltonian cycles. Lower bounding techniques: decision trees.

UNIT VIII: Limitations of Algorithm Power [2 Lectures]
P, NP and NP-Complete Problems

Textbooks:
1. Corman et al.: Introduction to Algorithms, McGrawHill.

Recommended Books:
1. Aho A, Hopcroft J., Ullman J.: The Design and Analysis of Algorithms, Addison-Wesley.

****

MCA 3rd SEMESTER SYLLABUS
DEPARTMENT OF COMPUTER SCIENCE & IT
COTTON UNIVERSITY

PAPER: MCA904L

LAB -III
(Credits: 0+1+2=3)

Laboratory work related with MCA C09 (Operating System)

1. Simple C programs in Unix platform: Programs using system calls, library function calls to display and write strings on standard output device and files.
2. Programs using fork system calls.
3. Programs for error reporting using errno, perror( ) function.
4. Programs using pipes.
5. Basic Shell programming.
6. Programs to simulate process scheduling like FCFS, Shortest Job First and Round Robin.
7. Programs to simulate page replacement algorithms like FIFO, Optimal and LRU.
8. Programs to simulate free space management.
9. Programs to simulate virtual memory.
10. Programs to simulate deadlock detection.

The course instructor may assign additional questions if s/he feels necessary.

Laboratory work related with MCA C10 (Database Management System)

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.Queries using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSECT, Constraints.
2. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.Queries implementing various joins (left,right,full). Implemention of complex queries: nested queries,sub queries.
3. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions(Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).
4. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
5. Develop a program that includes the features NESTED IF, CASE and CASE expression.
6. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT-IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
7. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
8. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
9. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.

10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

The course instructor may assign additional questions if s/he feels necessary.

Lab programs related with MCA C11: Design and Analysis of Algorithms

1. Using Graph notation to prove that bubble sort algorithm has time complexity (n^2).
2. Implement the Dynamic programming technique and analyze the algorithm using the graph notation.
3. Implement the Greedy programming technique and analyze the algorithm using the graph notation.
4. Implement the Divide and Conquer technique and analyze the algorithm using the graph notation.
5. Design a small file compressor and de-compressor by using Huffman coding technique.

The course instructor may assign additional questions if s/he feels necessary

****

(Open Elective)

PAPER: MCA905P

HUMAN COMPUTER INTERFACE PROGRAMMING

(Credits: 3+0+1=4)

UNIT I: Foundations of HCI [8 lectures]
The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

UNIT II: Design & software process [10 lectures]
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III: Models and theories [10 lectures]
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV: Mobile HCI [10 lectures]
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

UNIT V: Web interface design [10 lectures]
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Textbooks:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I, II & III).

Recommended books:

1. Brian Fling, "Mobile Design and Development", First Edition, O"Reilly Media Inc., 2009 (UNIT –IV).
2. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009. (UNIT-V).

Lab components:

1. 10 questions from UNIT I
2. 8 questions from UNIT II
3. 7 questions from UNIT III
4. 5 questions from UNIT IV
5. 7 questions from UNIT V

****