

Subject Code: MCA18205DCE
Subject Name: Unix/Linux Programming

Unit I

Introduction to Linux: History of Unix and Linux. Linux basic features and applications. Linux Distributions. Linux Directory Structure. Linux Installation Procedure. [4L]

Introduction to Linux Shell: Shell - Definition and its types. Shell commands – Simple, Compound, Complex, and Separators. [2L]

General Commands: File and Directory manipulations commands. Manipulating File attributes. Process control commands. Commands to evaluate expressions. [4L]

Text Processing Utilities: head, tail, cut, paste, sort, uniq, tr, grep. Regular Expressions. [3L]

Unit II

Introduction to Shell Scripting: Shell Script – Structure and execution. Variables - Defining and accessing Local variables, Shell variables, and Environment variables. Scalar and Vector variables. [3L]

Input/Output: Input from user, Input redirection and Pipes. Output to terminal and Output redirection. [2L]

Flow Control and Loops: Expressions – Arithmetic, Relational and Logical. Flow control – if statement and test command, case statement and patterns. Looping – while loop, until loop, for loop and select loop. Loop control – break and continue. [3L]

Substitution and Quoting: Filename, Variable, Command and Arithmetic substitution. Quoting with Backslashes, Single Quotes and Double Quotes. Quoting Rules and Situations. [3L]

Functions and parameters: Creating and calling a function. Passing and retrieving parameters. Returning a value. Positional parameters. [2L]

Unit III

Introduction to X-Window System: History, features and components of X-Window System. Architecture and working of X-Window System (X-Server, X-Protocol, X-Client, and X-lib).

X-Window System limitations and pitfalls. [4L]

Desktop Environment: Window Manager, Client Application, and GUI Toolkit. Approaches for Cross-platform GUI development. [3L]

GUI Programming using Qt: Basic structure of a Qt program. Compilation tools – qmake, make and moc. Introduction to Signals and Slots. [2L]

Introduction to basic Qt Widget Classes: QLabel, QLineEdit, QPushButton, QCheckBox, QRadioButton, QSpinBox, QListBox, QComboBox (Common Properties, Methods and Slots). Layout Managers. QWidget Class and extending Widgets. Adding Custom Slots to Widgets. [4L]

Text Book: S. Veeraraghavan, *Teach Yourself Shell Programming in 24 hours*, SAMS/Techmedia, 2007.

Reference Books:

1. C. Albing, J. Vossen, and C. Newham, *bash Cookbook*, O'Reilly Media, 2007.
2. T. Pavlidis, *Fundamentals of X Programming: Graphical User Interfaces and Beyond*, Kluwer Academic Publishers, 2002.
3. M. Dalheimer, *Programming with Qt: Writing Portable GUI Applications on Unix and Win32*, 2nd Edition, O'Reilly, 2002.
4. J. Blanchette and M. Summerfield, *C++ GUI Programming with Qt 4*, Prentice Hall, 2008.

Subject Code: MCA18205DCE
Subject Name: Unix/Linux Programming (Lab)

List of experiments/practical-assignments for the course:

- Week 1. This week students will learn how to acquire and install Linux operating system.**
- Download latest version of Linux operating system, preferably Fedora Core 20 (FC20) or above (Please visit <https://getfedora.org/>). Also, download latest version of Virtual Box for your preferred platform (Please visit <https://www.virtualbox.org/>).
 - Install FC20 on bare-machine after preparing it for single/dual boot configuration, or use Virtual Box to host FC20 in your preferred platform as instructed in the lecture.
- Week 2. This week students will learn how to use basic file and directory manipulation commands.**
- Enter a series of commands on Linux shell to create an empty file, rename it, move it to another directory, add contents to it using *vi* editor, display its contents, and delete it.
 - Enter a series of commands on Linux shell to create a directory, rename it, add 7 empty files and directories to it, list its contents, move it to another directory, and delete it.
- Week 3. This week students will learn how to manipulate permissions and evaluate expressions.**
- Create an empty text file, and use *chmod* to change its permission attributes by adding execute permissions for all users, removing write permission for group and others, and allowing read permission for only the user.
 - Enter a series of commands to calculate area of circle for radius 3 units.
- Week 4. This week students will learn how to use text-processing utilities.**
- Enter a series of commands to process a text file to list its top 3 lines, bottom 3 lines, and 3rd word of every line.
 - Enter a regular expression in *grep* to list all lines of a text file that begin with a capital letter.
 - Enter a regular expression in *grep* to list all lines of a text file that contain an opening and closing parenthesis, with only letters and single-spaces in between.
- Week 5. This week students will learn how to use flow control statements.**
- Write a shell script that reads a number from keyboard and checks whether the number is even or odd.
 - Write a shell script that takes backup of only those files residing in current directory which fulfill the following criteria:
 - are text files,
 - have extension '.txt', and
 - have size less than 3000 bytes.
- Week 6. This week students will learn how to use looping statements.**
- Write a shell script that reads and displays a text file line-by-line while adding an extra line-space while displaying.

- b. Write a shell script that iteratively calculates the factorial of a number that is read from the keyboard.

Week 7. This week students will learn how to use nested loops.

- a. Write a shell script that uses a nested loop to find prime numbers from 2 to 100.
- b. Write a shell script that declares and initializes an integer array of 10 elements and sorts its elements in ascending order using *bubble sort*.

Week 8. This week students will learn how to define a function, return value, and call it recursively.

- a. Write a shell script that defines a function that takes two integers as parameters, calculates their sum, and returns the result to the caller.
- b. Write a shell script that recursively calculates the factorial of a number (that is read from the keyboard) using functions.

Week 9. This week students will learn how to display basic Qt widgets, lay them on the canvas, and retrieve their values.

- a. Write a C++ program using Qt classes to create an application that allows a user to enter Name (using QLineEdit), Age (using QSpinBox), Gender (using QRadioButton), Country of residence (QComboBox), Course preferences (using QCheckBox), and so on. The application should display the formatted information using QLabel after pressing the Submit button.

Week 10. This week students will learn how to use default Slots and create custom Slots.

- a. Write a C++ program using Qt classes to create an application in which the text entered in a Textbox (QLineEdit) can be copied into another Textbox or Listbox (QListBox) or Combo-box (QComboBox) depending upon the push-button (QPushButton) pressed.
- b. Write a C++ program using Qt classes to create an application in which selecting an item from a Listbox (QListBox) removes it from the Listbox and adds the same item to Combo-box (QComboBox).

Week 11. This week students will be tested to apply the knowledge gained in previous weeks.

- a. Write a C++ program using Qt classes to create a 2-player tic-tac-toe game using QPushButton class.
- b. Further modify the program above to include Computer as one of the players.

Week 12. This week students will learn how to validate the user-input.

- a. Write a C++ program using Qt classes to create a simple calculator that does addition, subtraction, multiplication and division of real numbers using QLineEdit and QPushButton classes.
- b. Further modify the program above to include input data validation.

Subject Code: MCA18207DCE
Subject Name: MANAGEMENT INFORMATION SYSTEM

Unit I

Organization and Information Systems, The Organization: Structure, Managers and activities – Data, information and its attributes – The level of people and their information needs - Types of Decisions and information - Information System, - Management Information System (MIS) –Decision Support System (DSS) and Group Decision Support System (GDSS). (12 lectures)

Unit II

Need for System Analysis - Stages in System Analysis - Structured SAD and tools like DFD, Context level Diagram, Decision Table and Structured Diagram. System Development Models: Waterfall, Prototype, Spiral, –Roles and responsibilities of System Analyst, Database Administrator and Database Designer. (12 lectures)

Unit III

Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM – Customer Relationship Management (CRM): Phases. Knowledge Management and e-governance, Nature of IT decisions- Strategic decision. (12 lectures)

Unit IV

Security and Ethical Challenges, Ethical responsibilities of Business Professionals – Business, technology, Computer crime – Hacking, cyber theft, unauthorized use at work. Issues and internet privacy. Challenges – working condition, health and social issues, Ergonomics and cyber terrorism. (12 lectures)

RECOMMENDED/BOOKS:

1. “Management Information Systems”, Kenneth J Laudon, Jane P. Laudon, Pearson/PHI,10/e, 2007
2. “Management Information Systems”, W. S. Jawadekar, Tata McGraw Hill Edition, 3/e, 2004
3. Turban, Efraim, Ephraim McLean, and James Wetherbe. 2007. Information Technology for Management: Transforming Organizations in the Digital Economy. New York, John Wiley & Sons.

Subject Code: MCA18207DCE

Subject Name: MANAGEMENT INFORMATION SYSTEM (Tutorials)

Week 1:

Q1. What is MIS and MIS definition.

Week 2:

Q2. Role and concept of MIS.

Week 3:

Q3. Objectives and Needs.

Week 4:

Q4. Types of Information System.

Week 5:

Q5. MIS Development Process: SDLC.

Week 6:

Q6. Ethical and Social issues.

Week 7:

Q7. Selection, Criteria and merits of ERP.

Week 8:

Q8. Challenges in implementation of ERP.

Week 9:

Q9. Features and modules of Supply Chain Management.

Week 10:

Q10. Phases of Customer Relationship Management.

Week 11:

Q11. Nature of IT decisions, Strategies.

Week 12:

Q12. Computer crime: Hacking, Cyber theft, unauthorized use at work.

Week 13:

Q13. Ergonomics and Cyber Terrorism.

Subject Code: MCA18302CR
Subject Name: Design and Analysis of Algorithms

Unit I

Introduction to Algorithms, Analysis of algorithms, Designing Algorithms, Growth of Functions, Asymptotic notations (4L)

Recurrences, Substitution method, Iteration method, Recursion trees (4L)

The Master Method, Time and Space Complexity study of some basic algorithms. (4L)

Unit II

Randomized Algorithms: Identifying the repeated element, Primality testing, Advantages and Disadvantages. (4L)

Divide and Conquer, General method, Binary search, Quick sort, Merge sort (4L)

Greedy Method, General method, Knapsack problem, Single source shortest paths.(4L)

Unit III

Dynamic programming, General methods, All pair shortest paths, Traveling salesman problems. (4L)

Backtracking, General method, 8-Queen problem, Sum of subsets, Knapsack problem.(4L)

Branch and Bound, General method, Least Cost Branch and Bound, 8-Queen Problem(4L)

Unit IV

Lower boundary theory, Lower bound theory through reductions, P and NP problems. NP hard and NP complete problems. (6L)

Approximate Algorithms and their need, The vertex Cover Problem, The traveling salesman problem, The subset sum problem (6L)

Text Book:

1. Horowitz, Sahni, Rajasekaran “Fundamentals of Computer Algorithms”, Galgotia Publications

Reference Books:

1. Cormen, Leiserson, Rivest, Stein, “Introduction to Algorithms”, 2nd edition, PHI.
2. Michael T. Goodrich, Roberto Tamassia “Algorithm Design and Applications”, Wiley
3. Aho, Hopcroft and Ullman, “The Design and Analysis of Computer Algorithms”, Pearson.

Subject Code: MCA18302CR
Subject Name: Design and Analysis of Algorithms (Tutorial)

Week 1. Illustrate with suitable examples the following divide and conquer algorithms

- Binary Search
- Quick Sort
- Merge Sort

Week 2. Analyze performance of above divide and conquer algorithm

Find an optimal solution to the Knapsack problem instance $n=3$, $m=20$, $(p_1, p_2, p_3) = (25, 24, 15)$ and $(w_1, w_2, w_3) = (18, 15, 10)$?

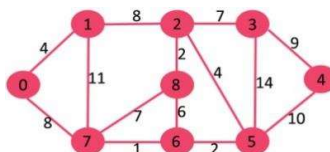
Week 3. Using dynamic programming method, find the optimal tour and its length (cost) for the directed graph whose edge lengths are represented by the following matrix?

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

Week 4. Trace the Quick sort algorithm on the following array of nine elements:

65, 70, 75, 80, 85, 60, 55, 50, 45

Week 5. Explain greedy (Dijkstra) algorithm for Single source shortest path using the following graph?



Week 6. Generate using backtracking algorithm the dynamic state space tree for the 0/1 Knapsack problem with following data: profit $p = \{11, 21, 31, 33, 43, 53, 55, 65\}$, weight $w = \{1, 11, 21, 23, 33, 43, 45, 55\}$ and knapsack capacity $m = 110$ and $n = 8$.

Recursions

Substitution method	Guess the form of the solution and prove it by induction
Iteration Method	Convert the recurrence into a summation and solve it
Master Method	Bound a recurrence of the form:

	$T(n) = aT(n/b) + f(n) \quad a \geq 1, b > 1$ <ol style="list-style-type: none"> 1. if $f(n) = O(n^{\log_b a - \epsilon})$, $\epsilon > 0$ then $T(n) = \Theta(n^{\log_b a})$ 2. if $f(n) = \Theta(n^{\log_b a})$ then $T(n) = \Theta(n^{\log_b a} \log n)$ 3. if $f(n) = \Omega(n^{\log_b a + \epsilon})$, $\epsilon > 0$ and $af(n/b) \leq cf(n)$ for $c < 1$ then $T(n) = \Theta(f(n))$
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Week 7.

$$T(1) = 1$$

$$T(n) = T\left(\frac{n}{2}\right) + \sqrt{n}$$

Prove that $T(n) = O(\sqrt{n})$ using the substitution method.

Week 8.

$$T(n) = T(a) + T(n-a) + \Theta(1)$$

Find $T(n)$ using the iteration method.

Week 9.

Use the Master method to find $T(n) = \Theta(?)$ in each of the following cases:

- $T(n) = 7T(n/2) + n^2$
- $T(n) = 4T(n/2) + n^2$
- $T(n) = 2T(n/3) + n^3$

Week 10.

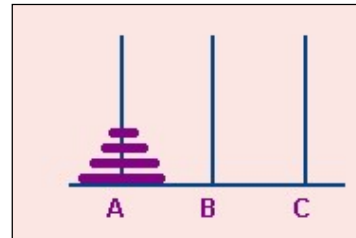
$$\begin{array}{llllll} \text{Fibonacci} & & \text{series} & & \text{is} & & \text{defined} & & \text{as} & & \text{follows:} \\ f(0) & & & & & & & & & & 0 \\ f(1) & & & & & & & & & & 1 \\ f(n) & & = & & f(n-1) & & + & & f(n-2) & & \end{array}$$

Find an iterative algorithm and a recursive one for computing element number n in Fibonacci series, $\text{Fibonacci}(n)$.

Analyze the running-time of each algorithm.

Week 11.

Hanoi towers problem:



n disks are stacked on pole A. We should move them to pole B using pole C, keeping the following constraints:

- We can move a single disk at a time.
- We can move only disks that are placed on the top of their pole.
- A disk may be placed only on top of a larger disk, or on an empty pole.

Analyze the given solution for the Hanoi towers problem; how many moves are needed to complete the task?

```
static void hanoi(int n, char a, char b, char c){  
    if(n == 1)  
        System.out.println("Move disk from " + a + " to " + b + "\n");  
    else{  
        hanoi(n-1,a,c,b);  
        System.out.println("Move disk from " + a + " to " + b + "\n");  
        hanoi(n-1,c,b,a);  
    }  
}
```

Week 12.

$T(n) = 3T(n/2) + n \log n$
Use the Master-Method to find $T(n)$.

Week 13.

Matrix multiplication

Given two $n \times n$ matrix, A and B, give an efficient algorithm that computes its matrices

multiplication $C=A \cdot B, C_{ij} = \sum_{k=1}^n A_{ik} B_{kj}$.

Analyze the time complexity of this algorithm.

Subject Code: – MCA18102CR
Subject Name: Database Systems

Unit I

Database basics – DBMS, RDBMS, ORDBMS. Characteristics and Services of Database Management System, Advantages and Disadvantages of DBMS. Schemas, and Instances, Comparison Three Schema Architecture and Data Independence. Database Languages. DBMS architectures, Criterion for Good Database Design [3L]

Data Models: Object Based Model, Record Based Model. Codd's rules [3L].
Relational Algebra – Basic and Derived operators with examples [2L]

Database Design through Functional Dependencies & Normalization. Functional Dependencies, Lossless Join, Normal Forms: 1NF, 2NF, 3NF, 4NF (BCNF) [4L]

Unit II

Introduction to Oracle, Tools of Oracle, Introduction to SQL, Data Types, Data Definition Language, Data Manipulation Language [4L]

Transaction Control Language, Integrity Constraints, SQL Functions, Set Operators and Joins, View, Synonym and Index [4L]

Sub Queries and Database Objects, User Management, Privileges, Locks and SQL Formatting Commands. [4L]

Unit III

Introduction to PL/SQL, Basic Architectures, Data Types, Conditional and Looping Logic [4L].

Concept of Implicit and Explicit Exception Handling, Cursors and Database Triggers, Subprograms and Packages. [4L]

UNIT IV

Transaction Processing –Transaction Processing Basics, Transaction and Systems Concepts, Transaction Properties. [2L]

Characterizing Schedules and Recoverability, Schedules and Serializability. [2L]

Concurrency Control - Two Phase Locking, Timestamp Ordering. [2L]

Database Recovery – Basic Concepts, Transaction Rollback, Recovery based on Deferred and Immediate Update, Shadow Paging [2L]

Reference Books:

1. Fundamentals of Database Systems, Elmasri&Navathe, Pearson Education Ltd. 2016.
2. Database System Concepts, Silberschatz, Korth, &Sudarshan, McGraw-Hill, 2011.
3. An introduction to Database Systems, Date C. J, Pearson, 2006.
4. SQL, PL/SQL: The Programming Language of Oracle, Bayross I. BPB Publications, 2009
5. Teach Yourself SQL and PL/SQL Using Oracle 8i and 9i with Sqlj, Bayross I. BPB Publications, 2003

Subject Code: MCA18102CR
Subject Name: Database Systems (Tutorials)

Week 1

- Q1. Explain the terms Data, Database and DBMS?
- Q2. What are the various characteristics of Database Management Systems?
- Q3. Explain basic concepts of ER model in DBMS.
- Q4. Explain Codd's rule for relational DBMS.

Week 2

- Q1. Explain basic concepts of RDBMS and its ER model.
- Q2. . Explain various normal forms in DBMS.
- Q3. Explain Relational Algebra and Relational Calculus.
- Q4. Explain different types of Database Keys.

Week 3

- Q1. Explain basic concepts of SQL (DDL, DML, TCL, DCL and DQL).
- Q2. Practice "create" command of DDL on tables.
- Q3. Practice "Alter" command of DDL on tables.
- Q4. Practice "Drop, Rename and truncate" commands of DDL on tables.

Week 3

- Q1. Practice "select" command of DML on tables.
- Q2. Practice "insert" command of DML on tables.
- Q3. Practice "update" command of DML on tables.
- Q4. Practice "delete" command of DML on tables.

Week 4

- Q1. Practice queries Using Operators: Arithmetic, Logical and Comparison.
- Q2. Practice "Commit" command of TCL.
- Q3. Practice "Commit work" command of TCL.
- Q4. Practice "save point and Rollback" command of TCL.

Week 5

- Q1. Practice "grant and revoke" commands of DCL.
- Q2. Practice "Where and like" clause on tables.
- Q3. Practice "order by and group by" clause on tables.
- Q4. Practice "Having" clause on tables.

Week 6

- Q1. Practice applying Data Integrity constraints (Domain Constraint, Validity Integrity and Entity Integrity) on tables.
- Q2. Practice applying Referential Integrity constraints on tables.
- Q3. Practice various Aggregate functions of SQL.
- Q4. Practice Date Functions, Numeric Functions, Character Functions, Conversion Functions of SQL.

Week 7

- Q1. Practice SQL Set operations on tables (Union, Union All, Intersect, Minus).
- Q2. Practice "Cross Join" on tables.
- Q3. Practice "Inner Join or Equi Join" on tables.
- Q4. Practice "Natural Join" on tables.

Week 8

- Q1. Explain PLSQL and its basic architecture.
- Q2. Explain various Data types in PLSQL.
- Q3. Explain various concepts of Exception handling in PLSQL.
- Q4. What are triggers in PLSQL

. Week 9

- Q1. Explain packages in PLSQL.
- Q2. Explain Cursors in PLSQL
- Q3. Explain the concept of functions in PLSQL.
- Q4. Explain various loops used in PLSQL.

Week 10

- Q1. What is a Transaction and explain its properties.
- Q2. Explain various states of Transactions.
- Q3. Explain Serializability.
- Q4. What are Equivalence Schedules?

. Week 10

- Q1. Explain Recoverability.
- Q2. What is concurrency control?
- Q3. Explain Lock based protocols in concurrency control.
- Q4. Explain Two Phased Locking Protocol.

. Week 11

- Q1. Explain Time Stamp Ordering protocol.
- Q2. What is Thomas Write Rule?
- Q3. What is Database Recovery?
- Q4. What are various structures used for Database recovery?

. Week 12

- Q1. Explain Forward and Backward Rolling.
- Q2. Explain recovery based on deferred update.
- Q3. Explain recovery based on immediate update
- Q4. Explain recovery based on Shadow paging.