

**DAV UNIVERSITY JALANDHAR**

**FACULTY OF SCIENCE**



**Course Scheme and Syllabus  
for**

**Master of Computer Applications  
(Two Years Degree Course)**

**1<sup>st</sup> to 4<sup>th</sup> Semester**

**(As per Choice Based Credit System)**

**Syllabi Applicable for 2020 Batch**

**Master of Computer Applications**  
**Syllabus 2020-22**

**Duration:** 2 years (4 Semesters)

**Eligibility:** Bachelor's degree of minimum three years duration in BCA/B.Sc.(IT)/B.Sc.(CS) or equivalent/B.Voc. with Computer as a major subject and with mathematics at 10+2 level or at graduation level with at least 50% aggregate marks (45% in case of candidate belonging to SC/ST)

Or

Bachelor Degree in Computer Science & Engineering or equivalent with at least 50% aggregate marks (45% in case of candidate belonging to SC/ST)

Or

Any bachelor's degree of minimum three years duration with mathematics at 10+2 level or at graduation level **and** minimum One Year Diploma in Computer Applications/Science/IT or equivalent from any recognized University/Institution at least 50% aggregate marks (45% in case of candidate belonging to SC/ST)

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S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA517	Discrete Mathematical Structures	Core	4	0	0	4
2	CSA518	Advanced Database Management System	Core	4	0	0	4
3	CSA519	Data Structures and File Processing	Core	4	0	0	4
4	CSA520	Software Testing and Quality Assurance	Core	4	0	0	4
5	CSA521	Python Programming	Core	4	0	0	4
5	CSA522	Advanced Database Management Systems Laboratory	Core	0	0	4	2
6	CSA523	Data Structures and File Processing Laboratory	Core	0	0	4	2
7	CSA524	Python Programming Laboratory	Core	0	0	4	2
				<b>20</b>	<b>0</b>	<b>12</b>	<b>26</b>

**Semester 2**

S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	CSA525	Advanced JAVA & Network Programming	Core	4	0	0	4
2	CSA526	Linux and Shell Programming	Core	4	0	0	4
3	CSA527	Advanced Web Technology	Core	4	0	0	4
4	CSA577	Design and Analysis of Algorithms	Core	4	0	0	4
5	CSA578	Computer Based Optimization Techniques	Core	4	0	0	4
6	CSA528	Advanced JAVA & Network Programming Laboratory	Core	0	0	4	2
7	CSA529	Advanced Web Technology Laboratory	Core	0	0	4	2
8	CSA530	Linux and Shell Programming Laboratory	Core	0	0	4	2
				<b>20</b>	<b>0</b>	<b>12</b>	<b>26</b>

Students will adopt MOOC course or 4 weeks Summer Training under registered company after 2<sup>nd</sup> Semester. If student has adopted summer training program then examination will be conducted along with 3<sup>rd</sup> semester practical.

**Note: Scheme and syllabus of 3rd and 4th semesters will be uploaded shortly.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Marks</b>
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4	0	0	4	100
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**Course Title: Discrete Mathematical Structures**

**Course Code: CSA517**

**Course Duration: 45-60 Hours**

**Course Objective:** The objective of this course is to acquaint the students with the basic concepts in Discrete Mathematics viz. sets, functions, relations, groups, graphs etc. required for the implementation of various computer science courses.

**UNIT – A**

**12 Hours**

**Set Theory**

- Set and its Representations, Types of sets
- Subsets
- Operations on Sets-Union, Intersection and Difference of Sets
- Venn Diagrams, Statement Problems
- Laws- Associative Laws, Distributive Laws, Demorgan's Laws

**Relation and Functions**

- Relations, Pictorial Representations of Relations, Composition of Relations, Types of Relations, Closure Properties
- Equivalence Relations and Partitions, Hasse diagram, Lattices, Bounded Lattices, Distributive Lattices.
- Functions, Special functions, Composition of Functions, one-one, onto and Inverse of a function
- Mathematical functions, Exponential and Logarithmic Functions

**UNIT – B**

**Group Theory**

**13 Hours**

- Group Axioms, Semi groups, Properties of Groups
- Subgroups
- Cosets, , Normal subgroup
- Permutation Group
- Dihedral Group

**Recurrence relations**

- Characteristic Equation
- Homogeneous and non-homogeneous linear recurrence relations with constant coefficients
- Generating Functions for some standard sequences

**UNIT – C**

**10 Hours**

**Graphs**

- Basic Terminology, Special Graphs,
- Handshaking Theorem,
- Isomorphism of Graphs,
- Walks, Paths, Circuits, Eulerian and Hamiltonian Paths
- Planar and Non Planar Graphs,
- Coloring of Graph, Directed graphs, Travelling Salesman Problem

**Logic and Propositional Calculus**

- Propositions,

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- Basic logic operators
- Logic equivalence involving Tautologies and Contradiction
- Algebra of Propositions
- Conditional and Biconditional Statements
- Logical Implication, Propositional Functions, Quantifiers

**UNIT – D**

**10 Hours**

**Vectors and Matrices**

- Vectors, Matrices
- Matrix Addition, Scalar Multiplication
- Matrix Multiplication, Transpose
- Square matrices
- Invertible Matrices, Inverses, Determinants

**Counting and Probability Theory**

- Basic counting principle, Factorial Notation
- Binomial Coefficients, Permutations, Combinations
- Sample Space and Events
- Finite Probability Spaces
- Conditional Probability
- Independent Events, Binomial Distribution
- Random variables

**Reference Books:**

1. Rosen, K. H., *Discrete Mathematics and its Applications*, 6<sup>th</sup> Edition, McGraw Hill, 2007.
2. Malik, D.S. and Sen, M.K., *Discrete Mathematical Structures: Theory and Applications*, Thomson Cengage Learning, New Delhi, 2004.
3. Lipschutz, S. and Lipson M., *Schaum's Outline of Discrete Mathematics*, Schaum's Outlines, New Delhi, 2007
4. Ram, B., *Discrete Mathematics*, Pearson Publications, 2011.
5. Liu, C. L., *Elements of Discrete Mathematics*, McGraw Hill, International Edition, Computer Science Series, 1986.
6. Trembley, J.P. and Manohar, R.P., *Discrete Mathematical Structures with Applications to Computer Science*, McGraw Hill.
7. Joshi, K.D., *Foundations of Discrete Mathematics*, Wiley, 1989
8. Alan Doerr and Kenneth Levarseur., *Applied Discrete Structures for Computer Science*, Creative Commons, 2012.

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**Course Title: Advanced Database Management System**

**Course Code: CSA518**

**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation.

**UNIT– A**

**10 Hours**

**Introduction to Data Base and Data Models**

- General Architecture of a Data Base Management Software, Advantages and Disadvantages of DBMS, Entity Relationship model, hierarchical model from network to hierarchical, relational model, object oriented database, object relational database

**Data Base Design**

- Functional dependencies; Normalization,
- Multivalued dependencies, decomposition, Relational algebra and calculus, Need and types of query optimization procedures, phases of query optimization

**UNIT – B**

**10 Hours**

**Data Base Protection**

- Concurrency, recovery, Integrity, Protection, essentials of security authorization, types of database security

**Relational Query Language**

- SQL, client/server architecture, Technical introduction to Oracle.

**Software Development using SQL**

- SQL data types, Querying database tables
- Conditional retrieval of rows, working with Null values, matching a pattern from the table querying multiple tables: Equi joins, Cartesian joins, Outer joins
- Self joins; Set operator: Union, Intersect, Minus, Nested queries

**UNIT – C**

**10 Hours**

**Introduction to PL/SQL**

- The PL/SQL block structure, PL/SQL data types, Variables and constants, assignment and expressions, Writing PL/SQL code, cursor management in PL/SQL
- Concept of stored procedures, Database triggers, types of triggers, Dropping triggers, storage of triggers

**Parallel Databases**

- **Database System Architectures:** Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, **Parallel Databases:** I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism

**UNIT – D**

**15 Hours**

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### **Distributed Database Concepts**

- Distributed Data Storage, Distributed Transaction, Commit Protocols, Distributed Query Processing, Multidimensional Databases

### **Temporal Databases**

- Introduction to Temporality, Temporal relationships, temporal hierarchies,

### **Spatial Databases**

- Spatial data types, spatial relationships, Topological Relationships, Spatial Data Structures and methods of storage.

### **NOSQL Databases**

- Introduction to Open Source Database, Query Optimization.

### **XML Databases**

- XML Data Model, DTD, XML Schema, XML query languages: XML-QL, Lorel, Quilt, XQL, XQuery, and Approaches for XML query processing, Query processing on relational structure and storage schema, XML database management system.

### **Reference Books:**

1. Desai. B.C., *An Introduction to Database Systems*, New Delhi: Galgotia Publ. Private Ltd, 2000.
2. C.J.Date, A.Kannan, S.Swamynathan, *An Introduction to Database Systems*, 8th Edition, Pearson Education, 2006.
3. Silberschatz, Korth and Sudarshan, *Database System Concepts*, Third Ed., New York: McGraw Hill International Editions, Computer Science Series, 2010.
4. Peter Rob Carlos Coronel, *Data Base Systems* (3rd Edition), New Delhi: Galgotia Publications (P) Ltd, 2001.
5. Elmasri, Navathe, *Fundamentals of Database System*, 7e, Pearson India.
6. Kleinberg J., Tardos E., *Algorithm Design*, 1st Edition, Pearson, 2012.
7. Ivan Bayross, *SQL, PL/SQL The Programming Language of Oracle*, 4th Revised Edition, BPB Publications, 2009.
8. Peter Rob Carlos Coronel, *Database Systems*, Cengage Learning, 8th ed, 2007.
9. Jeffrey A Hoffer, Shamkant B Navathe, Thomas M Connolly, Ramez Elmasri, *Advanced Database Management System*, Pearson Education, 2011.

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**Course Title: Data Structures and File Processing**  
**Course Code: CSA519**  
**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** The emphasis of this course is on the organization of information, the implementation of common data structures such as lists, stacks, queues, trees, and graphs.

**UNIT– A**

**12 Hours**

**Preliminaries**

- Introduction to Data Structures: Primitive and Composite, Various data structures
- Common operations on data structures, algorithm complexity
- big O notation, timespace tradeoff between algorithms
- Complexity of Algorithms, Records and Pointers.

**Arrays**

- Arrays defined, representing arrays in memory, various operations on linear arrays
- Multi dimensional arrays, Matrices, Sparse Matrices
- Linear Search, Binary Search
- Insertion Sort, Selection Sort, Bubble Sort
- Merge Sort, Radix Sort

**UNIT – B**

**13 Hours**

**Linked Lists**

- Types of linked lists, representing linked lists in memory
- Advantage of using linked lists over arrays
- Various operation on linked lists

**Stacks**

- Description of stack structure, implementation of stack using arrays and linked lists
- Applications of stacks converting arithmetic expression from infix notation to polish and their subsequent evaluation
- Quicksort technique to sort an array, parenthesis checker.

**Queues**

- Implementation of queue using arrays and linked lists
- Deques, Priority Queues and their implementation, applications of queues.

**UNIT – C**

**10 Hours**

**Trees**

- Description of tree structure and its terminology, binary search tree
- Implementing binary search tree using linked lists
- Various operations on binary search trees, AVL Trees



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**Heaps**

- Description of heap structure, implementing heaps using arrays
- Various operations on heaps, Applications of heaps
- Heapsort technique to sort an array

**UNIT – D**

**10 Hours**

**Graphs and Hash Tables**

- Representation of Graphs and Applications: Adjacency Matrix, Path Matrix
- Warshall's Algorithm, Linked Representation of a Graph
- Traversing a Graph, DFS and BFS.
- Direct address tables, hash tables
- Collision resolution by chaining, hash functions
- Open addressing – linear probing, quadratic probing, double hashing

**Files**

- Operations on files, Types of files
- File Organizations: Sequential files, Indexed Sequential file, Directed files and multikey files
- File performance criteria and terms.

**Reference Books:**

1. Lipschutz Seymour, *Theory and Problems of Data Structures*, Schaum Outline Series, New Delhi: Tata McGrawHill Book Company, 2001.
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis In C*, Mexico City: Addison Wesley, (An Imprint of Pearson Education), New Delhi: Prentice Hall of India Pvt. Ltd, 1993.
3. Esakov Jeffery, Weiss Tom, *Data Structures: An Advanced Approach Using C*, New Delhi: Prentice Hall International, Inc, 2007.
4. Trembley and Sorenson, *An Introduction to Data Structures with Application*, New York : McGraw Hill Company, 1984.
5. Tanenbaum, *Data Structures using C*, New Delhi: Pearson Education, 2009.
6. Kleinberg J., Tardos E., "Algorithm Design", 1st Edition, Pearson, 2012.
7. Alan L. Tharp, *File Organization and Processing*, Wiley; 1st Edition, 1988.

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**Course Title: Software Testing and Quality Assurance**  
**Course Code: CSA520**  
**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** The students will gain the knowledge about software testing techniques, STEP methodology, software testing strategies, software metrics, software quality assurance tools and techniques, quality management, quality models and system configuration management.

**UNIT-A**

**Introduction**

**15 Hours**

- Software Testing, Objectives of Software Testing, Software Testing Process, Static and Dynamic Analysis
- STEP Methodology, Elements of STEP and STEP Architecture

**Software Testing Techniques**

- BBT & its Technique, Boundary Value Analysis, Cause-Effect Graph, White-Box Testing and its Techniques
- Domain and Boundary Testing, Logic Based Testing, Data Flow Testing

**UNIT-B**

**15 Hours**

**Software Testing Strategies**

- Characteristics, Integration Testing, Functional Testing
- Object Oriented Testing, Alpha and Beta Testing, Overview of Testing Tools
- Test planning, functional testing, stability testing and debugging techniques

**Metrics for Software**

- Importance of Metrics to Software Project, Software Quality Metrics
- Software Metrics: Product Metrics: Software Size Metrics, Control Complexity Metrics, Object-Oriented Metrics, Software Quality Metrics

**UNIT-C**

**Quality Assurance**

**15 Hours**

- Concept of Software quality, product and process quality, software quality metrics, quality control and total quality management,
- Quality tools and techniques, quality standards, Software Quality Attributes, Factors Affecting Software Quality
- Building software quality assurance plan, Components of SQAP

**Quality Management & Quality Models**

- Software Quality System, Quality Management Principles, Essence of International Standards

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- ISO 9000 Quality Standard, SEI Capability Maturity Model

**Designing software quality assurance system**

- Statistical methods in quality assurance, fundamentals of statistical process control, process capability, Six-sigma quality

**UNIT-D**

**15 Hours**

**Reliability**

- Basic concepts, reliability measurements, predictions and management
- Factors affecting software reliability, Software reliability vs hardware reliability, Software reliability metrics

**System Configuration Management (SCM)**

- Basic requirements for SCM System, SCM principles, Planning and organizing for SCM
- Benefits of SCM, Change Management, Version and Release Management

**Reference Books:**

1. Schulmeyer G.G. and McManus J. (eds.), *Handbook of Software Quality Assurance* New Delhi: Prentice Hall, 3<sup>rd</sup> Ed. 1999
2. Deutsch, Wills and Hall, *Software Quality Engineering: A Total Technique and Management Approach*, New Delhi: PHI, 1993.
3. Futrell Robert T., Snafer Donald F., Shafter Linda I., *Quality Software Project Management*, New Delhi: Pearson, 2002.
4. Perry, William E., *Effective Methods for Software Testing*, New York: Wiley, 1995
5. Hutcheson, *Software Testing Fundamentals*, Wiley India Pvt. Ltd, 2007.
6. Gill Nasib Singh, *Software Engineering: Software Reliability, Testing and Quality Assurance*, Khanna Book Publishing, 2009.
7. Galin Daniel, *Quality Assurance: From theory to implementation*, New Delhi: Pearson Education Ltd., 2004
8. Kan S.H., *Metrics and Models in Software Quality Engineering*, New Delhi: Pearson, 2<sup>nd</sup> Ed, 2003.
9. Myers Glenford J., *The Art of Software Testing*, New York: John Wiley, 2<sup>nd</sup> Ed. 2004.

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**Course Title: Python Programming**  
**Course Code: CSA521**  
**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** This course provides the knowledge about developing programs and scripts using Python programming language. All the advanced concepts of programming will help benefit the students in research as well in software development.

**UNIT-A**

**Introduction to Python Language**

**15 Hours**

- Programming language, History of Python, Origin of Python Programming, Features, Limitations, Applications, Getting and Installing Python, Python Environment Variables, Python Help, Python differences from other languages.

**Python Data Types and Input Output**

- Keywords, Identifiers, Variables, Statements, Indentation, Documentation, Data Type, Type Conversion.
- Python Input and Output.

**Operators and Expressions**

- Arithmetic, Comparison, Assignment, Logical, Bitwise, and Python special operators.
- Expressions, Precedence and Associativity.

**UNIT-B**

**15 Hours**

**Control Structures**

- Decision Making Statements
- Python Loops

**Python Native Data Types**

- Creation of following Data Types along with methods and functions
- Number, String, Tuple, Set, Dictionary

**Python Functions and Modules**

- Creating Functions, Advantages of Functions, Types of Functions, Built-In, User Defined Functions, Anonymous Functions, Call by Value, Call by Reference, Recursion.
- Designing of Modules. Importing Modules

**UNIT-C**

**15 Hours**

**Python Class and Objects**

- Designing Classes, Creating Objects, Accessing Objects, \_\_init\_\_ method, constructor, garbage collection, destroying objects.

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- Inheritance and Operator Overloading.

**File Handling**

- File creation, open() and close() methods, read() and write() methods, file modes, file encoding, file object attributes, renaming and deleting files, Python directory, directory methods and functions.

**Exception Handling**

- Python Exception, Built-in Exception, Exception Handling, Try, except, finally, Python user defined exceptions.

**UNIT-D**

**15 Hours**

**GUI Programming in Python (using Tkinter/wxPython/Qt)**

- What is GUI, Advantage of GUI, Introduction to GUI, Layout Management, Events and Bindings, Fonts, Colors, Drawing on Canvas, Line, Oval, Rectangle, etc. Widget such as Frame, Label, Button, Check Box, Entry, ListBox, Radiobutton, Message, Text, Spinbox, etc.

**Database connectivity in Python**

- Installing mysql connector, accessing connector module module, using connect, cursor, execute & close functions, reading single & multiple results of query execution

**Reference Books:**

1. M. C. Brown, *The Complete Reference Python*, Osborne/McGraw-Hill, 2018.
2. S. Maruch, A. Maruch, *Python for Dummies*, John Wiley & Sons, 2011.
3. A. B. Downey, *Think Python*, O'Reilly Media Inc., 2012.
4. B. Slatkin, *Effective Python*, Addison Wesley Professional, 2015.
5. J. M. Zelle, *Python Programming: An Introduction to Computer Science*, Franklin, Beedle & Associates, Inc., 2004.

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**Course Title: Advanced Database Management Systems  
Laboratory  
Course Code: CSA522**

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of SQL: DDL, DML, DCL, TCL
2. Implementation of Nested Queries and Join Queries.
3. Implementation of Cursors.
4. Implementation of Procedures and Functions
5. Implementation of Triggers
6. Implementation of various DBA roles/techniques: Creation of user, Granting of privileges to the users, Creation of roles, Loading of privileges into user defined roles,
7. Import/Export data between various databases and flat files

**Course Title: Data Structures and File Processing Laboratory  
Course Code: CSA523**

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of Data Structures: **Arrays Linked List, Stack, Queues, Trees**, etc
2. Implementation Searching: Linear and Binary
3. Implement Sorting: Bubble, Selection, Insertion, and Quick
4. Binary tree using pre-order, post-order and in-order traversals
5. Implementation of Traversal on graph using Depth First Search and Breadth First Search
6. Implement AVL Trees as well as various operations of searching, insertion and deletion on AVL Trees.

**Course Title: Python Programming Laboratory  
Course Code: CSA524**

L	T	P	Credits	Marks
0	0	4	2	50

1. Implementation of Python programs: Control Structures, Lists, Tuples,
2. Strings, Dictionary, Sets, Files,
3. Exception handling, Classes and Objects,
4. Inheritance, Overloading, GUI Programming,
5. Database Connectivity, etc

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**Course Title: Advanced JAVA and Network Programming**  
**Course Code: CSA525**  
**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** To introduce Advanced JAVA concepts to the students with the design of network protocols.

**UNIT – A**

**10 Hours**

**Abstract Window Toolkit**

- Review of Java Basic Features
- Applets
- AWT Controls
- Event Handling
- Multithreading, I/O Files

**Swing**

- Features, Components, Swing Vs AWT, Swing Containers, Controls, Using Dialogs,
- Sliders, Progress Bars, Tables, Creating User Interface using Swing

**UNIT – B**

**15 Hours**

**Java Database Connectivity**

- Connectivity model, Java. SQL package, JDBC Exception
- classes
- Database connectivity
- Data manipulation and navigation
- Creating Database Applications

**Java RMI**

- Distributed object technologies
- RMI architecture
- Creating RMI applications.

**UNIT – C**

**10 Hours**

**TCP Connection**

- TCP Connection establishment & Termination
- Port Numbers and Concurrent Servers
- Protocol Usage by common Internet Applications

**UDP Connection**

- UDP Communication Semantics
- UDP Echo Server
- Echo Client working
- Protocol Usage by Common Internet Applications

**UNIT-D**

**10 Hours**

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### **Networking**

- Networking basics
- Client/server model
- Java and the Net, TCP/IP client sockets
- TCP/IP server sockets
- Inet Address, URL
- Data grams, creating networking applications

### **Socket Programming**

- Sockets Address Structures
- Byte ordering & Manipulation Functions
- TCP Socket System Calls

### **Reference Books:**

1. Stevens W. Richard, *Networking Programming*, New Delhi: Pearson Education, 2007.
2. Stevens W. Richard, *Advanced Programming in UNIX Environment*, New York: Addison Wesley Professional, 2013
3. Cornell, Gary and Horstmann Cay S, *Core Java*, Vol I and Vol II, CA: Sun Microsystems Press, 2008.
4. Bayross Ivan, *Web Enabled Commercial Application Development using Java 2.0*, New Delhi: BPB, 2000.
5. Schildt Herbert, *The Complete Reference Java 2*, New Delhi: TMH, 2005.



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**Course Title: Linux and Shell Programming**

**Course Code: CSA526**

**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** This course provides an introduction to programming with file handling utilities, security by file permissions, process utilities, basic linux commands, Scripts and filters. To familiarize students with fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts, kernel support for file, file structure related system calls (file API's), inter process communication, semaphore and shared memory .

**UNIT—A**

**15 Hours**

**Introduction to Linux And Linux Utilities**

- A brief history of LINUX, architecture of LINUX
- Linux/Unix operating system, Linux/Unix architecture
- Features of Linux/Unix, Accessing Linux system
- Starting and shutting down system, Logging in and Logging out

**Commands in Linux**

- Introduction to vi editor. Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin. Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio File oriented commands, directory oriented commands..

**UNIT—B**

**10 Hours**

**The Linux File system**

- Linux/Unix files, inodes and structure and file system
- File system components, Standard file system
- File system types, file system mounting and unmounting.

**Processes in Linux**

- Process, process identifiers, process structure: process table, viewing processes, system processes, process scheduling
- Starting new processes: waiting for a process, zombie processes, orphan process, fork, vfork, exit, wait, waitpid, exec, signals functions, unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions, signal sets. File locking: creating lock files, locking regions, use of read and write with locking, competing locks, other lock commands, deadlocks.

**UNIT—C**

**10 Hours**

**Shell Programming**

- Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization, control structures, loops, subprograms,

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creating shell scripts

- Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

### **UNIT—D**

**10 Hours**

#### **Inter Process Communication**

- Pipe, process pipes, the pipe call, parent and child processes, and named pipes: fifos
- semaphores: semget, semop, semctl, message queues: msgget, msgsnd, msgrcv, msgctl, shared memory: shmget, shmat, shmdt, shmctl, ipc status commands.

#### **Introduction To Sockets**

- Socket, socket connections - socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications

#### **Reference Books:**

1. Sobell Mark G., *A Practical Guide to Linux Command and Shell Programming*, New Delhi: Pearson Publishers, India 2012.
2. Robbins, *Linux Programming by Example: The fundamentals*, New Delhi: Pearson Publishers, India 2011.
3. Drew and Mike Harwood, *Linux + Certification Guide*, New Delhi: TataMc-Graw Hill Publishers, 2009.
4. John Goerzen, *Linux Programming Bible*, IDG Books, New Delhi 2000.
5. Behrouz A. Forouzan, Richard F. Gilberg. Thomson, *Unix and shell Programming*, Cengage Learning; 1st Edition, 2003.
6. W. Richard. Stevens, *Advanced Programming in the UNIX Environment, 3rd edition*, Pearson Education, New Delhi, India, 2005.
7. Robert Love, *Linux System Programming*, O'Reilly Media, 2013.

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**Course Title: Advanced Web Technology**  
**Course Code: CSA527**  
**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:**

- To build web applications using ASP and client side script technologies based on Microsoft's IIS.
- Creating web based applications using ADO.Net
- To build Web services and creating XML files for writing and reading data from XML

**UNIT—A**

**10 Hours**

**Introducing**

- History of the Internet and World Wide Web
- HTML 4 protocols – HTTP, SMTP, POP3, MIME, IMAP

**ActiveX Controls Object Based Scripting for the web.**

- Introduction to The TextBox Control, The List Box Controls, The Combo Box Control, The Scroll Bar, The Slider Control, The FlatScrollBar Control, File Controls, Timer Control, Advanced ActiveX Control, Common Dialogs Control, The TreeView Control, The ImageList Control, The ListView Control

**UNIT—B**

**13 Hours**

**Overview of ASP .NET Framework**

- ASP.NET and the .NET Framework, Understanding the framework class Library, Understanding the Common language Runtime, Installing the ASP.NET Framework, Introduction of ASP .NET
- Creating your First ASP .NET Web, Understanding ASP.NET Pages, Understanding ASP.NET Controls, Overview of ASP.NET Controls, Understanding HTML Controls, Understanding and Handling Control Events
- Understanding Control Trees, Using Code –Behind pages, Deciding Between Single-File and Code-Behind Pages, Handling Page Events, Using the Page.IsPostBack Property, Debugging and Tracing ASP.NET Pages, Debugging Pages with Visual Web Developer, ASP.Net Applications, Web Server (IIS Server)

**Web Forms & Web Forms Control**

- Introduction, Web Forms, WEB FORM CONTROL, Server Control, Client Control, WEB FORMS & HTML, Adding control to a web form, Submitting From Data, Accepting User Input, Using the Label Control
- Using the Checkbox Control, Using the Radio Button Control, Performing Cross-Page Posts, Specifying a Default Button, Displaying Images, Using the ImageMap Control, Using the Panel Control, Using the HyperLink control, Running a Web applications, Multi forms, Creating a Multiform

**UNIT—C**

**12 Hours**

**Form Validation:**

- Introduction, Client Side and Server Side Validation, Client Side Validation,

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Server Side Validation, Overview of the Validation Controls, Validation Control and JavaScript, Using Page.IsValid, Validation Controls

- Using the RequiredFieldValidator control, Using the CompareValidator Control, Using the RangeValidator control, Calendar Control, Ad-rotator Control (Displaying Advertisements), Using the RegularExpressionValidator Control, Using the CustomValidator Control, Using the ValidationSummary Control, Creating Custom Validation Controls, Creating a LengthValidator Control, Creating an Ajaxvalidator control

### **State Management & Rich Control::**

- Introduction, State Management, Client – Side State Management, Server - Side State Management:, Advantages of State Management, Accepting File UPLOADS, Saving Files to the file System, Displaying Different Page Views, Displaying a Tabbed Page view, Displaying a Multi – Part form, Displaying a Wizard

### **UNIT—D**

**10 Hours**

#### **Introduction of ADO .NET:**

- Introduction, The ADO.NET Data Architecture, Component classes that make up the Data Providers, Connected and Disconnected Database, Create an XML Web service using ASP.NET, Create a disconnected ADO.NET Windows application
- Create Connection using ADO .NET object model, Building a Connection String, Connection Classes, Executing Commands, DataSet Classes, Using an XSD Schema to Create a Typed DataSet, Using the Designer to Build a Typed DataSet, Programming with a Typed DataSet, DataAdapter Classes, Filling Typed DataSets
- Using TableAdapters, Adding Additional Queries to a Typed DataSet, Display data on data bound control, Working with List controls, Working with tabular databound controls, Using ASP.NET Parameters with DataSource controls, Overview of SQL Server 2005 Express , Features of SQL Server Express, SQL Server 2005 Express Management tools, Server Database Versus Local Databases

#### **Database Accessing on Web Application:**

- DataBinding Concept with Web, Understanding Templates and DataBinding Expressions, Using Templates, DataGrid Control, Creating DataGrid, Binding standard web server control, Working with tabular databound controls, Display data on web form using DataBound Control

#### **Web Service & XML:**

- Introduction to XML, Reading and Writing DataSet's Data in XML File, Writing Data in XML, Reading data from XML, Remote Method Call using XML, Web Services Overview, Soap Message, ASP.NET Web Services, Web Services Description Language, Building & Consuming a web service, Changes to our source, Performance Counter Web Service, Testing Web Services, Consuming, Contract, Command line tool, Using the Web Service, Web Applications Deployment, Deploying Applications

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**Reference Books:**

1. Stephen Walther, *ASP.NET 4 Unleashed*, Sams Publishing, 2004.
2. George Shepherd, *Microsoft ASP.NET 4 Step by Step (Microsoft)*, Paperback Edition, 2010.
3. Scott Mitchell, *Teach Yourself ASP.NET 4 in 24 Hours*, Complete Starter Kit.
4. A. Russell Jones, *Mastering Asp.Net with Visual C#*, CA, USA: SYBEX Inc. Alameda 2002
5. Wallace B. McClure, *Professional ADO.NET 2: Programming with SQL Server 2005, Oracle, and MySQL* Wrox 2005.

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**Course Title: Design and Analysis of Algorithms**

**Course Code: CSA577**

**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** The objective of the module is to create skills in students to design and analysis of algorithms.

**UNIT – A**

**10 Hours**

**Algorithms and Analysis**

- Introduction
- Algorithms specification
- Recursive algorithms
- Space and Time Complexity
- Asymptotic Notation ( $O$ ,  $\Theta$  and  $\Omega$ ) practical complexities, Best, average and worst case performance of algorithms
- Introduction to recurrence relations

**Divide and Conquer**

- General method,
- Binary Search, Merge sort, Quick sort, Selection sort,
- Analysis of these problems

**UNIT – B**

**10 Hours**

**String Processing and Greedy Method**

- KMP
- Boyre-Moore
- Robin Karp algorithms

**Greedy Method**

- General Method, Knapsack problem
- Job sequencing with deadlines
- Minimum spanning Trees
- Single Source Shortcut paths and analysis of these problems

**UNIT – C**

**10 Hours**

**Dynamic Programming**

- General method, Optimal Binary Search Trees
- 0/1 Knapsack
- The Travelling Salesperson Problem

**Back Tracking**

- General method, 8 queen's problem
- Graph Coloring
- Hamiltonian Cycles
- Analysis of these Problems

**UNIT – D**

**15 Hours**

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**Branch and Bound**

- Least Cost Search and LC Branch and Bound
- Bounding
- FIFO Branch and Bound
- 0/1 Knapsack Problem
- Travelling Salesperson Problem

**Introduction to Complexity Theory**

- NP-Hard and NP-Complete Problem
- Basic concepts, Cook's theorem, examples of NP-Hard problems
- Approximation Algorithms

**Reference Books:**

1. Horowitz, Ellis and Sahni, *Fundamentals of Computer Algorithms*, New Delhi: Galgotia Publications, 2nd Edition, 2008
2. Aho, A.V., Hopcroft, J.E., Ullman, J.D., *The Design and Analysis of Computer Algorithms*, Addison-Wesley, First Edition, 2003.
3. Bentley, J.L., *Writing Efficient Programs*, New Delhi: Prentice-Hall India, Eastern Economy Edition, 2009.
4. Goodman, S.E. & Hedetniemi, *Introduction to the Design and Analysis of Algorithms*, New Delhi: Tata McGraw-Hill Book Comp, 2004.
5. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, Pearson Education, 3<sup>rd</sup> Edition, 2012.
6. Michael T Goodrich and Roberto Tamassia : *Algorithm Design*, Wiley India, 2002.

**Master of Computer Applications  
Syllabus 2020-22**

**Course Title: Computer Based Optimization Techniques**

**Course Code: CSA578**

**Course Duration: 45-60 Hours**

L	T	P	Credits	Marks
4	0	0	4	100

**Course Objective:** To introduce linear programming, dynamic programming and related Optimization Theories to solve real life / simulated problems.

**UNIT – A**

**10 Hours**

**Introduction**

- The Historical development
- Nature, Meaning and Management Application of Operations Research Modelling
- Its Principal and Approximation of O.R. Models
- Main Characteristic and Phases
- General Methods of solving models
- Scientific Methods, Scope, Role on Decision Making
- Development of Operation Research in India

**UNIT – B**

**15 Hours**

**Linear Programming**

- Mathematical formulation of linear programming problems
- Canonical and standard forms of linear programming problems
- Solution by Graphical & Simplex method
- Revised simplex method
- Two phase & Big-M method, Duality, Primal-Dual Relationship
- Simplex Method
- Economic Interpretation of Optimal simplex Solution

**Special Types of Linear Programming Problems**

- Transportation
- Assignment Problems

**UNIT – C**

**10 Hours**

**Integer & Dynamic Programming**

- Integer programming problem
- Branch and Bound Techniques
- Characteristics
- Deterministic DP Problems, Recursive Approach and Tabular method

**PERT / CPM**

- Project Planning
- Scheduling
- Activity Cost



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- Network Diagram Representation
- Difference between CPM and PERT
- Floats and Slack Times

**UNIT-D**

**10 Hours**

**Queuing Models**

- Introduction, Applications
- Characteristic, Waiting and Ideal time costs
- Transient and Steady states
- Kendall's Notations
- M/M/1, M/M/C, M/Ek/1 and Deterministic Models

**Reference Books:**

1. Hiller, F.S. & Liberman, G.J., *Introduction to Operations Research*, 2nd Edn. London Holden Day Inc., 1974.
2. Tara, H.A., *Operations Research*, 3rd Edn., New Delhi: PHI, 2004.
3. Beightler, C.S. & Phillips, D.T., *Foundations of Optimisation*, 2nd. Edn. New Delhi: Prentice-Hall, 1979.
4. McMillan Claude Jr., *Mathematical Programming*, 2nd. Edn., J. Wiley Series, 1975.
5. Srinath, L.S., *Linear Programming*, New Delhi: East-West, 1975.
6. Churchman, C.W. & Arnchoff, E.L., *Introduction to Operations Research*, New York: John Wiley and Sons, 1988.
7. Srinivasan G., *Operations Research: Principles and Applications*, PHI, 2010
8. Prasad Durga, M.V, *Operations Research* , Cengage Publications, 2012.

**Master of Computer Applications  
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**Course Title: Advanced JAVA & Network Programming**

**Laboratory**

**Course Code: CSA528**

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of Swings Components
- Implementation of Events Listeners
- Implementation of Remote Method Invocation
- Implementation of Database Connectivity
- Implementation of network protocol design, socket programming using JAVA

**Course Title: Linux and Shell Programming**

**Laboratory**

**Course Code: CSA529**

L	T	P	Credits	Marks
0	0	4	2	50

- Installation of Linux operating system.
- Working with basic commands
- Implementation of Shell Programming: vi Editor, controls structures, loops  
Creating shell scripts
- Working with C environment in Linux operating System

**Course Title: Advanced Web Technology**

**Laboratory**

**Course Code: CSA530**

L	T	P	Credits	Marks
0	0	4	2	50

- Implementation of ActiveX controls
- Working web forms and web form controls
- Creating web based applications using ADO.Net
- Design Web services and creating XML files for writing and reading data from XML