Post Graduate Department of Computer Sciences,
The University of Kashmir,
Srinagar - 190006

Choice Based Credit System Curriculum for

Master of Computer Applications
(MCA) Programme
2021 – 2023

Eligibility for 2-year MCA degree Programme:

"Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree.

OR

Passed B.Sc./ B.Com./ B.A with Mathematics at 10+2 Level or at Graduation Level(with additional bridge Courses as per the norms of the concerned University).Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination"

Semester-I

Subject Code	Subject name	Subject Category	Hours / Week			Credits Units
			L	T	P	
Core Courses (14 Credit Units)						
MCA21101CR	Programming with C++	Core	3	0	2	4
MCA21102CR	Database Systems	Core	3	0	2	4
MCA21103CR	Computer Networks	Core	3	0	2	4
MCA21104CR	Accounting and Management Control	Core	2	0	0	2
Discipline Centric Elective Courses (8 Credit Units)						
MCA21105DCE	Discrete Mathematics	DCE	3	1	0	4
MCA21106DCE	Numerical Techniques	DCE	3	1	0	4
MCA21107DCE	Computer Architecture and ALP	DCE	3	0	2	4
OE (2 Credit Units) For Students of Other Departments						
MCA21101OE	Fundamentals of Computers	OE	2	0	0	2

Semester-II

Subject Code	Subject name	Subject Category	Hours / Week			Credits Units
			L	T	P	
Core Courses (14 Credit Units)						
MCA21201CR	Data Structures using C++	Core	3	0	2	4
MCA21202CR	Python	Core	1	0	2	2
MCA21203CR	Artificial Intelligence	Core	3	0	2	4
MCA21204CR	Software Engineering	Core	3	1	0	4
Discipline Centric Elective Courses (8 Credit Units)						
MCA21205DCE	**Web Programming**	DCE	3	0	2	4
MCA21206DCE	**Cryptography and Network Security**	DCE	3	0	2	4
MCA21207DCE	**Computer Graphics and Multimedia**	DCE	3	0	2	4
OE (2 Credit Units) For Students of Other Departments						
MCA21201OE	Web Designing	OE	2	0	0	2

Semester-III						
Subject Code	Subject name	Subject Category	Hours / Week			Credits Units
			L	T	P	
Core Courses (14 Credit Units)						
MCA21301CR	Design and Analysis of Algorithms	Core	3	0	2	4
MCA21302CR	Java Programming	Core	3	0	2	4
MCA21303CR	Operating System	Core	3	0	2	4
MCA21304CR	Machine Learning	Core	2	0	0	2
Discipline Centric Elective Courses (8 Credit Units)						
MCA21305DCE	Theory of Computation	DCE	3	1	0	4
MCA21306DCE	Wireless and Mobile Communication	DCE	3	1	0	4
MCA21307DCE	Organizational Behavior	DCE	3	1	0	4
OE (2 Credit Units) For Students of Other Departments						
MCA21301OE	Fundamentals of Programming with C	OE	2	0	0	2

Semester-IV						
Course Code	**Course name**	**Category**	**Hours / Week**			**Credits Units**
			L	T	P	
Core Courses (14 Credit Units)						
MCA21401CR	Project : Problem Identification	Core	0	4	0	4
MCA21402CR	Project : Problem Analysis	Core	0	4	0	4
MCA21403CR	Project : Dissertation	Core	0	6	0	6
Discipline Centric Elective Courses (8 Credit Units)						
MCA21404DCE	Project : In-Home Software Development	DCE	0	4	0	4
MCA21405DCE	Project : In-Home Research Component	DCE	0	4	0	4
MCA21406DCE	Project : Industrial Software Development	DCE	0	4	0	4
MCA21407DCE	Project: Industrial Research Component	DCE	0	4	0	4
OE (2 Credit Units) For Students of Other Departments						
MCA21401OE	Management Information System	OE	2	0	0	2

Semester I

Subject Code: MCA21101CR
Subject Name: Programming with C++

Unit I [12 L]
Data Types, Identifiers, Variables Constants and Literals. Arithmetic Relational Logical and Bitwise. Basic input/output statements **[2L]**
Control structures: if-else statement, Nested if statement, Switch statement Loops: while loop, do while, for loop, Nested loops**. [3L]**
Arrays**:** Declaration; initialization; 2-dimensional and 3-dimensional array, passing array to function, Strings and String functions, and character arrays. **[3L]**
Functions; prototype, passing parameters, storage classes, identifier visibility, Recursive functions[4L]

Unit II [12L]
Command-line arguments. Variable scope, lifetime. Multi-file programming, Introduction to macros. File processing in C. [4L]
Structures and unions: syntax and use, members, structures as function arguments passing structures and their arrays as arguments [2L]
Pointers: variables, pointers and arrays, pointers to pointers, strings, pointer arithmetic, portability issues, pointers to functions, void pointers, pointer to structure. [4L]
Introduction to object oriented programming, Abstraction, Encapsulation [2L]

Unit III [8L]
Introduction to classes and objects; Access specifiers, Constructor; destructor; Function overloading; Operator overloading; friend functions; Use of call-by-reference for efficiency. Copy constructor. [4L]
Inheritance: Single, Multiple, and Multilevel Inheritance[2L]
Virtual functions and Polymorphism/Dynamic binding vs Static binding; Virtual Destructors[2L]

Unit IV [8 L]
Pure virtual function; concrete implementation of virtual functions[2L]
Templates: Function Templates, Class Templates, Member Function Template and Template Arguments, namespaces, Exception Handling Concepts[4L]
Input and Output: Streams classes, Stream Errors, Disk File I/O with streams. [2L]

Reference Books:

1. FOSTER AND FOSTER "C by discovery" RRI penram.
2. ROBERT LAFORE "Object orientation with C++ Programming" Waite Group.
3. YASHWANT KANETKAR "Let us C" PHI.
4. E. BALAGURUSWAMI "Programming in ANSI C" Tata McGraw Hill.
5. BJARNE STROUSTRUP "The C++ programming language" Pearson Education.
6. HERBERT SCHILD "C++ The complete Reference" Tata McGraw Hill.

Course Code: MCA21101CR
Course Name: Programming with C++ Lab

Unit I

Lab Sheet 1

Q1. Write a program to demonstrate the use of Output statements that draws any object of your choice e.g. Christmas Tree using '*'

Q2. Write a program that reads in a month number and outputs the month name.

Q3. Write a program that demonstrate the use of various input statements like getchar(), getch(), scanf().

Q4. Write a program to demonstrate the overflow and underflow of various datatype and their resolution?

Lab Sheet 2

Q1. Write a program to demonstrate the precedence of various operators.

Q2. Write a program to generate a sequence of numbers in both ascending and descending order.

Q3. Write a program to generate pascals triangle.

Q4. Write a program to reverse the digits of a given number. For example, the number 9876 should be returned as 6789.

Lab Sheet 3

Q1. Write a program to convert an amount (upto billion) in figures to equivalent amount in words.

Q2. Write a program to find sum of all prime numbers between 100 and 500.

Q3. Create a one dimensional array of characters and store a string inside it by reading from standard input.

Q4. Write a program to input 20 arbitrary numbers in one-dimensional array. Calculate Frequency of each number. Print the number and its frequency in a tabular form.

Unit II

Lab Sheet 1

Q1. Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80,100.

Q2. Write a program which will arrange the positive and negative numbers in a one-dimensional array in such a way that all positive numbers should come first and then all the negative numbers will come without changing original sequence of the numbers. Example: Original array contains: 10-15,1,3,-2,0,-2,-3,2,-9 Modified array: 10,1,3,0,2-15,-2,-2,-3,-9

Q3. Write a program to compute addition multiplication and transpose of a 2-D array.

Q4. Implement a program which uses multiple files for holding multiple functions which are compiled separately, linked together and called by main(). Use static and extern variables in these files.

Lab Sheet 2

Q1. Implement a function which receiver a pointer to a Student struct and sets the values of its fields.

Q2. Write a program which takes five arguments on command line, opens a file and writes one argument per line in that file and closes the file.

Q3. Write a program which creates Student (struct) objects using malloc and stores their pointers in an array. It must free the objects after printing their contents.

Q4. Write a function char* stuff(char* s1,char* s2,int sp, intrp) to stuff string s2 in string s1 at position sp, replacing rp number of characters (rp may be zero).

Lab Sheet 3

Q1. Write a program to input name, address and telephone number of 'n' persons (n<=20). Sort according to the name as a primary key and address as the secondary key. Print the sorted telephone directory.

Q2. Write a program to find the number of occurrences of a word in a sentence ?

Q3. Write a program to concatenate two strings without using the inbuilt function?

Q4. Write a program to check if two strings are same or not?
Q5. Write a program to check whether a string is a palindrome or not?
Q6. Write a program to find the number of vowels and consonants in a sentence?

Unit III

Lab Sheet 1

Q1. Write a program that reverse the contents of a string.
Q2. Write a program to demonstrate the array indexing using pointers.
Q3. Write a program to pass a pointer to a structure as a parameter to a function and return back a pointer to structure to the calling function after modifying the members of the structure?
Q4. Write a program to demonstrate the use of pointer to a pointer.
Q5. Write a program to demonstrate the use of pointer to a function.
Q6. Write a program to demonstrate the swapping the fields of two structures using pointers?

Lab Sheet 2

Q1. Write a program in C++ to define class complex which having two data members viz real and imaginary part ?
Q2. Write a program in C++ to define class Person which having multiple data members for storing the different details of the person e.g. name,age, address, height etc.
Q3. Write a program to instantiate the objects of the class person and class complex ?
Q4. Write a C++ program to add member function that displays the contents of class person and class complex?
Q5. Write a C++ program to demonstrate the use of scope resolution operator?
Q6. Write a program in C++ which creates objects of Student class using default, overloaded and copy constructors.

Lab Sheet 3

Q1. Write a program to demonstrate the use of different access specifiers.
Q2. Write a C++ program to demonstrate the use of inline, friend functions and this keyword.
Q3. Write a C++ program to show the use of destructors.
Q4. Write a program in C++ demonstrates the use of function overloading.
Q5. Write a C++ program to overload the '+' operator so that it can add two matrices .
Q6. Write a C++ program to overload the assignment operator.
Q7. Write a C++ program to overload comparison operator operator== and operator!= .
Q8. Write a C++ program to overload the unary operator.

Unit IV

Lab Sheet 1

Q1. Write a program in C++ which creates a single-inheritance hierarchy of Person, Employee and Teacher classes and creates instances of each class using new and stores them in an array of Person * .
Q2. Write a program in C++ which creates a multiple-inheritance hierarchy of Teacher classes derived from both Person, Employee classes. Each class must implement a Show() member function and utilize scope-resolution operator
Q3. Write a program in C++ demonstrates the concept of function overriding?
Q4. Write a C++ program to show inheritance using different levels?
Q5. Write a C++ program to demonstrate the concepts of abstract class and inner class?

Lab Sheet 2

Q1. Write a C++ program to demonstrate the use of virtual functions and polymorphism?
Q2. Write a C++ program to demonstrate the use of pure virtual functions and virtual destructors?
Q3. Write a C++ program to swap data using function templates.

Q4. Write a C++ program to create a simple calculator which can add, subtract, multiply and divide two numbers using class template.

Lab Sheet 3

Q1. Write a C++ program to demonstrate the concept of exception handling.
Q2. Write a C++ program to create a custom exception.
Q3. Define a class with appropriate data members and member functions which opens an input and output file, checks each one for being open, and then reads name, age, salary of a person from the input file and stores the information in an object, increases the salary by a bonus of 10% and then writes the person object to the output file. It continues until the input stream is no longer good.

Subject Code: – MCA21102CR
Subject Name: Database Systems

Unit I

Introduction to Data, Information and Knowledge. Database basics – Need and evolution, Database and DBMS. Characteristics of Database Approach, Advantages and disadvantages of DBMS Approach. [**3L**]

Database System Concepts and Architecture – Data Models, Schemas, and Instances, Database Models and Comparison Three Schema Architecture and Data Independence. Database Languages and Interfaces. DBMS architectures. DBMS Classification. [**5L**]

Data Modeling: Overview of Data Modeling, Entity-Relationship (ER) Modeling. [**2L**]

UNIT II

Relational Data Model –Basic Concepts and Characteristics, Model Notation, Model Constraints and Database Schemas, Constraint Violations [**3L**].

Relational Algebra – basic concepts, Unary Relational Operations, Algebra Operations from Set Theory, Binary Operations, Additional Relational Operations [**3L**]

Criterion for Good Database Design. Database Design through Functional Dependencies & Normalization: Functional Dependencies, Lossless Join, Normal Forms: 1NF, 2NF, 3NF, BCNF. [**4L**]

UNIT III

Introduction to SQL, Data Types, Data Definition Language, Data Manipulation Language, Specifying Constraints in SQL, Transaction Control Language, SQL Functions, Set Operators and Joins, View, Synonym and Index, Sub Queries and Database Objects, Locks and SQL Formatting Commands. [**10L**]

UNIT IV

Transaction Processing –Transaction Processing Basics, Concurrency Control, Transaction and Systems Concepts, Desirable properties of Transactions. [**4L**]

Characterizing Schedules and Recoverability, Schedules and Serializability. Concurrency Control - Two Phase Locking, Timestamp Ordering. **[3L**]

Database Recovery – Concepts, Transaction Rollback, Recovery based on Deferred and Immediate Update, Shadow Paging [**3L**]

Text Book:

1. Elmasri and Navathe, Fundamentals of Database Systems, 7/e, Pearson, 2016

Reference Books:

1. Silberschatz, Korth, & Sudarshan, Database System Concepts, , McGraw-Hill, 7/e, 2011.
2. Bayross I. SQL, Pl/SQL: The Programming Language of Oracle, BPB Publications, 2009
3. Michael J. Hernandez ,Database Design for Mere Mortals®: A Hands-on Guide to Relational Database Design, Third Edition, Addison-Wesley Professional, 2013

Lab Manual for Database Systems (MCA21102CR)

UNIT I

Lab #1

a. List various users, functions and constraints of the database system for Library Management.

b. List various users, functions and constraints of the database system for Banking System.

Lab #2

a. Identify the various tables and draw a diagrammatic schema to represent the database of Library management system.

b. Identify the various tables and draw a diagrammatic schema to represent the database of University system.

Lab #3

a. Draw ER Model for the database of Library management system.

b. Draw ER Model for the database of University management system.

UNIT II

Lab #1

Consider the following schema:

Suppliers (sid, sname, address)
Parts (pid, pname, color)
Catalog (sid, pid, cost)

Write relational algebra queries to

a. Find the name of suppliers who supply some red parts.
b. Find the sids of suppliers who supply some red or green parts.
c. Find the sids of suppliers who supply some red part or are at Srinagar.
d. Find the sids of suppliers who supply some red and some green part.
e. Find the sids of suppliers who supply every part.
f. Find the sids of suppliers who supply every red part.
g. Find the sids of suppliers who supply every red or green part.

Lab #2

a. Consider a schema R(A,B,C,D) and functional dependencies A->B and C->D. Check the decomposition of R into R1(AB) and R2(CD) for lossless join and dependency preservation.

b. R(A,B,C,D) is a relation. Which of the following does not have a lossless join, dependency preserving BCNF decomposition?

1. A->B, B->CD
2. A->B, B->C, C->D
3. AB->C, C->AD
4. A ->BCD

Lab #3

a. Using a sample schema and data, demonstrate the use of 1NF, 2NF, 3NF and BCNF.

UNIT III

Lab #1

a. CreatetableStudentwithfollowingattributesandperformthefollowingoperations?

AttributeName	ST_ROLLNO	ST_NAME	ST_ADDRESS	ST_TELNO
Date Type	Number	Varchar	Char	Varchar2
Size	6	30	35	15

i. AddnewattributesCity,Street,CountrywithDatatypeVarcharandlength30?
ii. Modifyfield ST_ROLLNOand change thesize to5?
iii. RemovecolumnST_ADDRESS?
iv. DescribetheTableStudent?
v. DropTableStudent?
vi. CopyStructureof onetableto another

b. CreateUsersuser1, user2,user3andperformthefollowingoperations

i. Grant Session Privilege to the newly created users?
ii. Grant privileges for creating and manipulation tables?
iii. Grant data manipulation privileges to various users on tables?
iv. Grant privileges with grant option.
v. Revoke privileges.

Lab #2

a. CreateObject ADDRESSand usetheobjectinaTableDDL?

b. CreatetableStudent withfollowingattributesandperformthefollowing operations.

Attribute Name	ST_ROLLNO	ST_NAME	ST_STREET	ST_CITY	ST_State	ST_Country	DTE_REG
DateType	Number	Varchar	Char	Char	Varchar2	Varchar2	Date
Size	6	30	35	30	30	30	

i. Insert 10recordsinthetable.
ii. PerformvariousProjectOperationsusingSelectQuery.
iii. PerformvariousrestrictoperationsusingSelectQuery.
iv. Updaterecords inthetable.
v. Deleterecordsinthetable.
vi. Create another table with same structure as existing table without copying the data.
vii. Create another table along with the structure and data from existing table.

Lab #3

a. Create table Student with ST_ADDRESS as Object Type with following attributes and

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS				DTE_REG
			ST_STREET	ST_CITY	ST_State	ST_Country	
DateType	Number	Varchar	Char	Char	Varchar2	Varchar2	Date
Size	6	30	35	30	30	30	

i) Insert 10records.
ii) PerformvariousProjectOperationsusingSelectQuery.

iii) Performvariousrestrictoperationsusing SelectQuery.
iv) Updaterecords inthetable
v) Delete records in the table

b. CreatetableSTUDENT withfollowingattributesandperformthefollowingoperations?

Attribute Name	ST_ROLLNO	ST_NAME	ST_STREET	ST_CITY	ST_State	ST_Country	DTE_REG
Date Type	Number	Varchar	Char	Char	Varchar2	Varchar2	Date
Size	6	30	35	30	30	30	

i. Insert 10recordsinthetable.
ii. PerformvariousProjectOperationsusingSelectQuery.
iii. Performvariousrestrictoperationsusing SelectQueryusingvariousarithmeticand LogicalOperators like
a. LessThan
b. GreaterThan
c. LessThan orEqualto
d. GreaterThan orEqualTo
e. Equalto
f. Not EqualTo
iv. Performrestrict operationsshownto(iii)usingvariousdatatypeslikenumeric,Characters,Date.
v. PerformUpdateoperationsusingvariousArithmeticandLogicalOperatorsonTableSTUDENT
vi. PerformDeleteoperationsusingvariousArithmeticandLogicalOperatorsonTableSTUDENT
vii. UseInsertandSelectCommandstogetherwithArithmeticandLogicalOperators.

UNIT IV

Lab #1

a. Perform followingTransaction ControlOperationsontheabove table

ii. Perform various data manipulation operations the table .
iii. Create Five Savepoints from S1 to S5.
iv. Rollback to Various savepoints and observe the changes in the table.
v. Perform various DDL operations the table and observe its effect on Savepoint and Rollback on the table.
vi. Try to abnormally terminate the application to observe whether data is saved or not.
vii. Use Commit and Commit Work commands to save the data permanently.

b. CreatetableSTUDENTwithfollowingattributesandperformvariousDMLoperationst overify domain constraint

AttributeName	ST_ROLLNO	ST_NAME	ST_ADDRESS
Date Type	Number	Varchar2	Varchar
Size	6	30	35
Constraint	NOTNull	NotNULL	NOTNULL

Lab #2

a. Create table STUDENT with following attributes and perform various DML operations to verify Validity Integrity.

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS
Date Type	Number	Varchar2	Varchar

Size	6	30	35
Constraint	CHECK (ROLLNO >20001 and ROLLNO < 30001	NotNULL	NOTNULL

b. Create table STUDENT with following attributes and perform various DML operations to verify Entity Integrity using Primary and Unique Keys?

Lab #3

Attribut eName	ST_ROLLNO	ST_NAME	ST_ADDRSS
Date Type	Number	Varchar2	Varchar
Size	6	30	35
Constraint	Primary/UniqueKeys	NotNULL	NOTNULL

a. Create table STUDENT with following attributes and perform various DML operations to verify Referential Integrity using given tables (employee and department)?

AttributeN ame	EMP_ID	EMP_NAME	ST_ADDRESS	DEPT_ID
Date Type	Number	Varchar2	Varchar	Number
Size	6	30	35	4
Constraint	PrimaryKey	NotNULL	NOTNULL	Foreign Key

AttributeN ame	DID	NAME	Address
Date Type	Number	Varchar2	Varchar
Size	4	30	100
Constraint	Primary Key	NotNULL	NOTNULL

b. Write SQL queries to demonstrate use of Join and various SQL functions

Subject Code: MCA21103CR
Subject Name: Computer Networks

Unit I

Goals and applications of networks. LAN, MAN & WAN architectures. Concept of WAN subnet.**(3L)** Overview of existing networks. OSI Reference Model Architecture, TCP/IP Model and their comparison. **(3L)**
Protocol layers and service models. OSI and Internet protocols.**(4L)**

Unit II

Internetworking concept and architectural model. Connection-oriented and connection-less approaches. Discuss ATM and Ethernet. Concept of Virtual Circuits, Concept of Autonomous systems and Internetwork Routing. Classful IP addresses. Subnetting, Subnet addressing, IP Multicasting.**(5L)** Internet Protocol (IP): connectionless delivery of datagrams (MTU, fragmentation, reassembly). IP header structure. IP Addressing. Efficiency and consistency trade-offs. **(5L)**

Unit III

Internet control protocols: ICMP, ARP and RARP. Concepts of delay, security, and Quality of Service (QoS). Reliable data transfer. Stop-and-Go evaluation. TCP and UCP semantics and syntax. TCP RTT estimation.**(4L)**
Principles of congestion control. Principles of routing. Link-state and distance vector routing. Routing algorithms: Inter- and intra-domain routing. RIP, OSPF, BGP.CIDR. Transport Layer: UDP and TCP concepts. Socket API for Network Programming. **(6L)**

Unit IV

Client-Server application development using TCP & UDP sockets. Basic Server Architectures. Network Security: Overview of threats, cryptography, authentication, and firewalls their components. **(4L)** Encryption techniques and examples of encryption standards. Network management including SNMP. Network troubleshooting.**(6L)**

Reference Books:

1. Andrew Tanenbaum, “Computer Networks”, 4th Edition by Pearson.
2. Douglas Comer, “Internetworking with TCP/IP, Volume 1”, Pearson.
3. W. Richard Stevens, “UNIX Network Programming”, Pearson.
4. Maufer, “IP Fundamentals”, Pearson.
5. Douglas Comer, “Client-Server Programming with TCP/IP, Volume 3”, Pearson.

Subject Name: Computer Networks (Lab)

Lab Sheet 1

Unit I:

Q1. Network components such as Modem, Gateways, Routers, Switches, Cables etc.
Q2. Various network softwares, services and applications.

Lab Sheet 2

Unit I:

Q1. Network trouble shooting Techniques: Trouble shooting basic TCP/IP problems.
Q2. Commands like ipconfig, getmac, tracert, pathping, arp, ping, netstat, finger etc.

Lab Sheet 3

Unit I:

Q1. Straight cabling, Cross cabling, Signal testing, T568A and B wiring standards (including hands on practice)

Lab Sheet 1

Unit II:

Q1. Program that prints the address of www.bitmesra.ac.in
Q2. Program that prints all the addresses of www.indianrail.gov.in

Lab Sheet 2

Unit II:

Q1. Program that scans lower ports and prints them.
Q2. Program to list host names from command line, attempt to open socket to each one and print the remote host, the remote port, the local address and the local port.

Lab Sheet 3

Unit II:

Q1. Program for splitting the URLs entered into command line into component parts.

Lab Sheet 1

Unit III:

Q1. Program to list all the interfaces available on a workstation.
Q2. Basics of TCP/IP and UDP/IP socket Programming

Lab Sheet 2

Unit III:

Q1. Program for "echo" client. The Client enters data to the server, and the server echoes the data back to the clients.

Lab Sheet 3
Unit III:
Q1. Program for "echo" Server. The Server listens at the port specified and reads from client and echoes back the result.

Lab Sheet 1
Unit IV:
Q1. Basics of Serial Port programming

Lab Sheet 2
Unit IV:
Q1. Program to write out "Hello World" to a serial port or to a USB to Serial Converter.

Lab Sheet 3
Unit IV:
Q1. Simple RPC Programming. (Introductory level)

Subject Code: MCA21104CR
Subject Name: Accounting and Management Control

Unit 1

Evolution of Management: - Contribution of Taylor, Mayo & Fayol, Different approaches of management, role of manager, tasks of a professional manager, Management & its functions. Level of Management, managerial skills at various levels. Planning & Decision making: - Definition, Nature for planning, importance, Process of planning, decision making, nature importance & process, types of plans

Unit 2

Accounting, meaning, definition, objectives, accounting principles, branches of accounting, uses & limitations of Accounting, Basic Accounting Procedure –, rules of debit & credit, Practical system of book keeping – Cashbook, types of cash book, Profit & loss Account – meaning, Need & preparation, Balance Sheet- Meaning, need & Preparation,

Reference:

Principles & Practice of Management – L. M. Prasad
Management – Theory & Practice – C. B. Gupta
Basics of Accounting – Jain & Narang
Basic of Accounting – T. S. Grewal

Discipline Centric Elective Courses

Subject Code: MCA21105DCE
Subject Name: Discrete Mathematics

UNIT I

Proposition, Logic, Truth tables, Propositional Equivalence, Logical Equivalence, Predicates and Quantifiers; Sets: operations on sets, Computer representation of sets, Cardinality of a Set (4L)
Functions: Domain, Range, One-to-One, Onto, Inverses and Composition, Sequences and summations, Growth of functions. (3L)
Methods of Proof: Direct Proof, Indirect Proof, Mathematical Induction for proving algorithms; Counting techniques – Permutations, Combinations, The Pigeonhole Principle. (3L)

UNIT II

Discrete Probability, Advanced Counting Techniques: Inclusion-Exclusion, Applications of Inclusion exclusion principle, recurrence relations, solving recurrence relation. (4L)
Relations: Relations and their properties, Binary Relations, Equivalence relations, Diagraphs, Matrix representation of relations and digraphs. (3L)
Computer representation of relations and digraphs; Transitive Closures, Warshall's Algorithm, Problem solving on Warshall's Algorithm. (3L)

UNIT III

Partially Ordered Sets (Posets), External elements of partially ordered sets, Hasse diagram of partially ordered set, isomorphic ordered set, Lattices: Properties of Lattices, complemented Lattices. (5L)
Graph theory: Introduction to graphs, Graph Terminology Weighted graphs, Representing Graphs, Connectivity of Graphs: Paths and Circuits, Eularian and Hamiltonian Paths, Matrix representation of graphs. Graph Coloring and its applications. (5L)

UNIT IV

Trees: Rooted trees, Application of trees: Binary Search Trees, Decision Trees, Prefix Codes, Tree traversal, trees and sorting, spanning trees, minimal spanning trees. (5L)
Finite Boolean algebra, Functions on Boolean algebra, Boolean functions as Boolean polynomials. Groups and applications: Subgroups, Semigroups, Monoids Isomorphism, Homomorphism. (5L)

Text Book:

KENNETH H. ROSEN "Discrete Mathematics and Its Applications" The Random House/Birkhauser Mathematics series

Reference Books:

1. LIU, "Elements of Discrete Mathematics", Tata McGraw Hill
2. SCHAUMS, "Discrete Mathematics", Tata McGraw Hill.
3. KOLMAN/REHMAN, "Discrete Mathematical Structures", Pearson Education
4. NICODEMI "Discrete Mathematics", CBS

Subject Name: Discrete Mathematics (Tutorials)

Unit 1

Tutorial Sheet #1

1. Find whether $(p \rightarrow q) \leftrightarrow (\neg q \rightarrow \neg p)$ is a tautology or a contradiction?
2. Show that:
   $\neg (p \vee (\neg p \wedge q))$ and $(\neg p \wedge \neg q)$ are logically equivalent by using the propositional laws.
3. Let P(x, y, z) : "x + y = z". Find the truth values of the following:
   A) P(1, 2, 3)
   B) P(0, 0, 1)
4. How many students must be in a class to guarantee that at least two students receive the same score in the final exam, if the exam is graded on a scale from 0 to 100 points?

Tutorial Sheet #2

1. Each user on a computer has a password, which is six to eight characters long, where each character is an uppercase letter or a digit. Each password must contain at least one digit. How many possible passwords are there?
2. A playoff between two teams consists of at most five games. The first team that wins three games wins the playoff. In how many different ways can the playoff occur? Use tree diagram.
3. A young pair of rabbits (one of each sex) is placed on an island. A pair of rabbits does not breed until they are two months old. After they are two months old, each pair of rabbits produces another pair each month. Find a recurrence relation for the number of pairs of rabbits on the island after n months, assuming that no rabbits ever die.
4. Conjecture a simple formula for a_n if the first 10 terms of the sequence $\{a_n\}$ are:
   1, 7, 25, 79, 241, 727, 2185, 6559, 19681, 59047.

Tutorial Sheet #3

1. Show that the set of all integers is countable.
2. Give a direct proof of the theorem
   "If n is an odd integer, then n^2 is odd."
3. Express the statement "Everyone has exactly one best friend" as a logical expression involving predicates, quantifiers with a domain consisting of all people, and logical connectives.
4. Use a membership table to show that
   $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

Unit 2

Tutorial Sheet #1

1. How many onto functions are there from a set with six elements to a set with three elements?
2. Suppose there are seven coins, all with the same weight, and a counterfeit coin that weighs less than the others. How many weighing's are necessary using a balance scale to determine which of the eight coins is the counterfeit one? Give an algorithm for finding this coin.
3. Is the divides relation on the set of positive integers reflexive, symmetric, antisymmetric, and transitive?
4. What are the sets in the partition of the integers arising from congruence modulo 4?

Tutorial Sheet #2

1. What is the probability that when two dice are rolled, the sum of the numbers on the two dice is 7?
2. An urn contains four blue balls and five red balls. What is the probability that a ball chosen at random from the urn is blue?
3. How many ways are there to assign five different jobs to four different employees if every employee is assigned at least one job?

Tutorial Sheet #3

1. Draw the Hasse diagram of (D(75), divides), where the set D(75) represents the set of all positive divisors of 75.
2. Which elements of the poset **(**{2, 4, 5, 10, 12, 20, 25}, /**)**are maximal, and which are minimal?
3. Find a compatible total ordering for the poset **(**{1, 2, 4, 5, 12, 20}, / **)**.
4. Draw the Hasse diagram for the partial ordering $\{(A,B) \mid A \subseteq B\}$ on the power set $P(S)$ where $S = \{a, b, c\}$.

Unit 3

Tutorial Sheet #1

1. Find out the transitive closure of any relation R using Warshall's Algorithm.
2. Let R be the relation on the set of real numbers such that aRb if and only if $a - b$ is an integer. Is R an equivalence relation?
3. Let R be the relation on the set of people such that xRy if x and y are people and x is older than y. Show that R is not a partial ordering.

Tutorial Sheet #2

1. How many edges are there in a graph with 12 vertices, each of degree 4?
2. A connected graph has an Euler path but not an Euler circuit iff it has exactly two vertices of odd degree. Verify this theorem by drawing a graph of the said property.
3. What is the chromatic number of the graph Cn, where $n \geq 3$? (Cn is the cycle with n vertices.)

Tutorial Sheet #3

1. Show that $K_n$has a Hamilton circuit whenever $n \geq 3$.
2. Suppose that a connected planar simple graph has 20 vertices, each of degree 3. Into how many regions does a representation of this planar graph split the plane?
3. Use Dijkstra's algorithm to find the length of a shortest path between any two verticesin some weighted connected graph.

Unit 4

Tutorial Sheet #1

1. Use Prim's algorithm to find a minimum spanning tree of any graph.
2. Is the set Z (a set of integers) monoid under usual operation of +, - ?
3. Form a binary search tree for the following words in alphabetical order.
mathematics, *physics*, *geography*, *zoology*, *meteorology*, *geology*, *psychology*, and *chemistry*

Tutorial Sheet #2

1. What is the chromatic number of the complete bipartite graph $K_{m,n}$, where m and n are positive integers?
2. How can we find out whether two graphs are isomorphic or not?
3. Show that C_6 is bipartite. Also show that K_3 is not bipartite.

Tutorial Sheet #3

1. What is the significance of Erdos number with regards to Paths in Collaboration Graphs?
2. How can backtracking be used to decide whether a graph can be colored using n colors?
3. What is the value of following prefix expression?

   + - * 2 3 5 / ↑ 2 3 4

Subject Code: MCA21106DCE
Subject Name: Numerical Techniques

UNIT I: 10L

Computer Arithmetic: Introduction, Floating Point Representation and Arithmetic, Normalized Floating Point Representation of Numbers. (2L)

Approximations & Errors – Types of Programming Errors, Data Errors, Computer & Arithmetic Errors, Round off and Truncation Errors, Accuracy and Precision, Measures of Accuracy, Error Propagation (3L)

Iterative Methods - Non-Linear Equations, Types of Methods to find solutions to nonlinear equations, Algorithms to Compute Roots of Equation – Methods of Tabulation or Brute Force Method, Method of Bisection, Secant Method, Newton-Raphson Method, Method for False Position (5L)

Derivation of mathematical formulas and implementation of these methods

UNIT II: 10L

Solution of Simultaneous Algebraic Equations: Linear Equations, Types of Methods to find solutions to linear equations. Algorithms to Solve Linear Algebraic Equations: Gauss Elimination, Gauss Jordan, Gauss Seidel, L.U. Decomposition, Pivoting (10L)

Derivation of mathematical formulas and implementation of these methods

Unit III: 10L

Interpolation: Lagrange Interpolated Polynomial, Newton's Methods of Interpolation – Forward difference, Backward difference (4L)

Least Square Approximation of Functions: Linear Regression, Polynomial Regression (4L)

Taylor and Chebyshev Series (2L)

Derivation of mathematical formulas and implementation of these methods

UNIT IV: 10L

Differentiation and Integration: Simpsons Rule, Trapezoidal Rule (3L)

Numerical solution of Differential Equations using Taylor Series Method, Euler's Method, Modified Euler's Method, Runge-Kutta Methods, Predictor Corrector Formula, Higher order Differential Equations, Comparison of Runge-Kutta, Predictor and Correction Methods (7L)

Derivation of mathematical formulas and implementation of these methods

Text Books

1. S.C.Chapra&R.P.Canale: "Numerical methods for Engineering". Tata McGraw Hill.
2. Krishenmurty and Sen : "Numerical Algorithms"
3. V. Rajaraman "Computer oriented numerical methods." Prentice Hall of India
4. Grewal, B. S.: "Higher Engineering Mathematics", Hindustan Offset Problems Series.

Subject Code: MCA20106DCE
Subject Name: Numerical Techniques Tutorials

Tutorial Sheet 1
Unit I:

Q1.Define different types of errors.
Q2.Let X= 0.005998. Find relative error if x is truncated to 3 decimal digits
Q3.Let X= 0.005998. Find relative error if x is truncated to 3 decimal digits.

Tutorial Sheet 2
Unit I:

Q1.What do you mean by approximation and error?
Q1.Find the root of the equation $2x-x-3 = 0$ graphically.
Q2.Find the root of the equation correct to three decimal digits using False Position Method.

$$cos\ x\ -3x+1 = 0$$

Tutorial Sheet 3
Unit I:

Q1.What is the difference between accuracy and precision? Define the two ways for measuring accuracy.
Q2.Find the root of the equation correct to three decimal digits using Bisection Method.

$$X3 – 2X - 5 =0$$

Write the programming implementation of Bisection method for the above question.
Q3.Prove Newton-Raphson method analytically.

Tutorial Sheet 1
Unit II:

Q1.Prove Newton-Raphson method analytically
Q2.What are the various methods to obtain solutions of non-linear equations?
Q3.Solve the following system of linear equations using Gauss Seidel Method, correct to three decimal digits.

$$10x1 + x2 + 2x3 = 44$$
$$2x1 + 10x2 + x3 = 51$$
$$x1 + 2x2 + 10x3 = 61$$

Give the programmatic implementation of Gauss Seidel method

Tutorial Sheet 2
Unit II:

Q1.Give the programmatic implementation of Gauss Jordon method
Q2.What is the difference between the Gauss-Jordon and Gauss-Elimination?
Q3.Give examples of various direct and iterative methods to obtain solutions of non-linear equation.

Tutorial Sheet 3

Unit II:

Q1.Solve the following system of linear equations using Gauss Elimination Method.

$$2x1 + 8x2 + 2x3 = 14$$
$$x1 + 6x2 - x3 = 13$$
$$2x1 - x2 + 2x3 = 5$$

Q2.Give the programming implementation of Gauss elimination method.

Q3.Solve the following system of linear equations using Gauss Jordon Method.

$$2x1 - 2x2 + 5x3 = 13$$
$$2x1 + 3x2 + 4\,x3 = 20$$
$$3x1 - x2 + 3x3 = 10$$

Tutorial Sheet 1

Unit III:

Q1.What are the ways to approximate a function by a polynomial? Describe each in brief

Q2.We want to compute sin(x) correct to three significant digits. Obtain a series with minimum number of terms using Taylor series.

Q3.We want to compute sin(x) correct to three significant digits. Obtain a series with minimum number of terms using Chebyshev series.

Tutorial Sheet 2

Unit III:

Q1.Give the programmatic implementation of Chebsyshev series.

Q2.Give the derivation of trapezoidal method.

Q3.Give the programmatic implementation of trapezoid method.

Tutorial Sheet 3

Unit III:

Q1.State newton's methods of interpolation – forward difference, backward difference

Q2.State Linear Regression and Polynomial Regression

Q3.Give the programming implementation of Taylor Series

Tutorial Sheet 1

Unit IV:

Q1.Give a brief idea about runge-kutta (RK) methods.

Q2.Given dy/dx = xy with y(1) =5. Find solution correct to decimal positions in the interval [1,1.3] using RK second order method (step size h=0.1)

Q3.Provide the programmatic implementation of RK 2nd order method.

Tutorial Sheet 2

Unit IV:

Q1.Given dy/dx = xy with y(1) =5. Find solution correct to decimal positions in the interval [1,1.3] using RK second order method (step size h=0.1)

Q2.Explain the following terms with suitable examples.

a. Differential equation
b. Solution of Differential equation

c. Order of differential equation

Q3. Using Modified Euler's method, find the solution of the following differential equation dy/dx = x+y2, for x= 1.1, 1.2, 1.3. Given that y=1, x=1.

Tutorial Sheet 3

Unit IV:

Q1. Give the derivation of Modified Euler's method.

Q2. Differentiate between the following:

a. Single step and multiple step methods
b. Ordinary and partial derivate
c. Ordinary and partial differential equations

Give programmatic implementation of Least Square Method for curve fitting.

Subject Code: MCA21107DCE
Subject Name: Computer Architecture and ALP

Unit I:
8086 Microprocessor: 8086 Microprocessor Architecture (BIU, EU, Instruction Queue), Software Model (General Purpose Registers, Segment Registers, Flag & Other Registers). Segmentation. [4L] 8086 Pin Functions, Minimum and Maximum Mode, The 8086 Memory System [3L] 8086 Basic Programming: 8086 Programming Model, 8086 Instruction Formats, Addressing Modes. [3L]

Unit II:
The 8086 Instruction Set. [3L] , Assembly Language Programming: Significance, Assemblers and Linkers, TASM Directives – Data Definitions, Named-constants, User-defined, Segments, Subroutines, Macros, Modular-code. [3L] Programming with Data Transfer, Arithmetic and Logical Instructions: Data Transfer, Arithmetic, Logical/Bit Manipulation Instructions [4L]

Unit III:
Branching and Looping : Unconditional and Conditional Jump instructions, Decision making and looping, Loop instructions, ASCII and BCD Arithmetic, Processor Control Instructions. [5L] Shift Instructions, Rotate Instructions and String Instructions [3L] Stacks: Defining a stack, Push and Pop Instructions [2L]

Unit IV:
Procedures: Defining and Calling procedure. CALL and RET instructions, Parameter Passing Methods, Far procedure [3L] Macros: Working with macros, additional assembler directives [2L] INT 21H: INT 21H Keyboard Services, Display Services, and File Manipulation Services. [3L] Input/Output Instructions [2L]

Text Book: M.T. Savalia. 8086 Programming and Advanced Processor Architecture. Wiley India.

Reference Books: 1. T.P. Skinner. An Introduction to 8086/8088 Assembly Language Programming. John Wiley .
2. W. A. Triebel, A. Singh. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, And Applications. Pearson Education, 2007.
3. B. B. Brey, The Intel Microprocessors: Architecture, Programming and Interfacing, Merrill, 2nd Edition, 1991.

Subject Code: MCA21107DCE
Subject Name: Computer Architecture and ALP

UNIT 1:

LabSheet 1. This week students will learn how to declare, initialize and access varied-sized variables by using Assembler Directives and 8086 instructions.

a. Write a program that declares and initializes two integer variables (one 8-bit wide and another 16- bit wide), and then assigns new values to them using 8086instructions.
b. Write a program that declares and initializes a String array (byte array) of 10 elements, and then assigns new values to each element individually using 8086instructions.

LabSheet 2. This week students will learn how to use INT 21H service to read integers and strings from keyboard and display them on screen.

a. Writeaprogramthatreadsanintegervaluefromkeyboardusing INT21Hkeyboardservic e,stores
itinmemory,anddisplaysitusingINT21Hdisplayserviceafterdoingnecessary ASCIIconv ersion.
b. Write a program that declares and initializes a String array(byte array), and uses INT 21H display service to displays all elementsindividually.

LabSheet3. Thisweekstudentswilllearnhowtoperformarithmetic operations of 8-bitintegervalues.

a. Write a program that reads two 8-bit integers from keyboard (using INT 21H) and displays their sum and difference (using INT 21H after doing necessary ASCIIconversion).
b. Write a program that reads two 8-bit integers from keyboard (using INT 21H) and displays their multiplication and division result (using INT 21H after doing necessary ASCIIconversion).

UNIT 2:

LabSheet 1. This week students will learn how to perform various logical operations on integer values.

a. Write to program reads two integers from keyboard (using INT 21H) and displays the result ofthe AND, OR, XOR, CMP and TEST operation (using INT 21H after doing necessary ASCII conversion).

LabSheet 2. This week students will learn how to use a subroutine to recursively solve a problem.

a. Write a program that defines a subroutine that uses recursion to calculate factorial of an integer read from keyboard.

Lab Sheet 3. This week students will learn how to use Macros.

a. Write a program that uses a Macro to exchange the values of two 16-bit integer variables.

UNIT 3:

LabSheet 1. This week students will learn how to use 8086 instructions for looping and decision making.

a. Write a program that reads an integer from keyboard (using INT 21H service), and iteratively calculates its factorial.
b. Write a program that declares and initializes an array of 10 elements each 8-bit wide, reads an 8- bit integer from keyboard, searches its existence through the array, and displays the result of the searchoperation.
c. Write a program that declares and initializes an array of 10 elements each 8-bit wide, and sorts its elements in ascendingorder.

LabSheet 2: This weel students will learn how to perform rotate and shift operations.

a. Writetoprogramreadstwointegersfromkeyboard(usingINT21H)anddisplaystheresul tofthe SHL,SHR,SAR,ROL,ROR,RCL,andRCRoperation(usingINT21Hafterdoingnece ssaryASCII conversion).

LabSheet 3. This week students will learn how to define a subroutine, pass parameters to it, and return value from it.

a. Write a program that defines a subroutine, which takes two 8-bit integers as parameters via Registers, calculates their sum, and returns the result to thecaller.
b. Write a program that defines a subroutine, which takes two 8-bit integers as parameters via Stack, calculates their sum, and returns the result to thecaller.

UNIT 4:

LabSheet 1:This week students will learn how to read and write files residing on secondary storage using INT 21H service.

a. Write a program that opens an existing text file in the current working directory, and display its contents.
b. Writeaprogramthatcreatesafileincurrentworkingdirectory,writestextualdatatoit(rea d from keyboard), and closesit.

LabSheet 2. This week students will learn how to write, install and use a custom software-interrupt.

a. Write a program that creates a subroutine to display “hello world!”, installs the subroutine as ISR, and subsequently uses it via INTinterface.

LabSheet 3. This week students will learn how to write a simple device driver for VGA.

a. Writeaprogramthatdefinesasubroutine,whichtakesthreeparameters – row,column,addressof theString,andusesmemory-mappedI/Otodisplayitonscreen.Theprogramcallsthissubroutineto display a String inputted viakeyboard.

MCA21101OE
Fundamentals of Computers

Unit I

Introduction about computers: Computer Basics, characteristics, applications and limitations. Functional Block Diagram of computer.

Computer Architecture: Classification of computer on basis of Purpose, signal and size and portability, Evolution of computer from 1st generation to fifth generation, Data representation in memory.

Unit II

Hardware: Input devices used: Keyboard, mouse, OMR, OCR, MICR, BCR, Scanner, internal structure of CPU: Registers, ALU, Motherboard, HD, Memory, Cache, and Virtual Memory, Magnetic Disk, Optical Disk, Flash memory

Software: types of Software, Languages and their types, operating system, its types and various functions and types of operating system. Basic introduction about Interfaces: its types character user and graphical user interface (DOS and Windows)

Semester - II

Subject Code: MCA21201CR
Subject Name: Data Structures using C++

Unit I [10 L]
Data types/objects/structures, Data structures and its types, Representation and implementation. Linear Data Structures: Array representation, operations, applications and limitations of linear arrays, 2-dimensional arrays, matrices, common operations of matrices, special matrices, array representation of Sparse matrices[**4L**].
Linked Lists: Representation of Linear Linked List, Operations like creating , search an element inserting an element, deleting an element, reversing a list, merging two list, Deleting entire list. Linked list application, Polynomial Manipulation, Representing Sparse Matrices[**6L**]

Unit II [10 L]
Stack, Representation of stack in memory, Operations on Stacks, Implementation of Stack using arrays and linked list, Multiple Stacks: Representing two stacks and more than two stacks, Applications of stacks: Parenthesis Checker, Infix to postfix procedure, Evaluating expressions in postfix notation, Sparse Matrix Representation. Implementation of recursion using stack [**5L**] Queues, Representation of Queue in Memory, Operations on Queue, Implementation of Queue using arrays and linked list, Circular Queue and its operations, Representation and implementation, Multiple Queues, DEQUE, Priority Queue, ,Linked Queue, Multiple Priority queue, Heap Representation of a Priority Queue, Applications of Queues.[**5L**]

Unit III [10 L]
Trees, Definitions, terminologies and properties ,Binary tree representation ,traversals and applications, Threaded binary trees, Binary Search Trees, AVL Trees, M-way Search Trees, B-trees, B*-trees[**6L**].
Graphs, Terminology, Graph representations, Traversal Techniques, Operations on Graphs, Applications of Graphs[**4L**]

Unit IV [10 L]
Minimum spanning trees, Shortest Path Algorithms in Graphs, Eulerian Tour, Hamiltonian Tour Direct Address Tables, Hash Table, Different Hash functions, resolving collisions, rehashing, Heap Structures, Binomial Heaps, Leftist Heaps.[**6L**].
File Organizations: Sequential File Organization, Relative File Organization, Indexed Sequential File Organization, Multiple Key File Organizations: Inverted File and Multi-List Organizations[**4L**]

Text book:
1. SartajSahni, “Fundamentals of Data Structures in C++”, Galgotia Pub
References:
1 Heileman:data structure algorithims&Oop Tata McGraw Hill
2 Data Structures Using C – M.Radhakrishnan and V.Srinivasan, ISTE/EXCEL BOOKS
3 Weiss Mark Allen, “Algorithms, Data Structures, and Problem Solving with C++”, Addison Wesley.
4 Data Structures and Algorithms – O.G. Kakde& U.A. Deshpandey, ISTE/EXCEL BOOKS
5 Aho Alfred V., Hopperoft John E., UllmanJeffreyD., “Data Structures and Algorithms”, Addison Wesley
6 Drozdek- Data Structures and Algorithms,Vikas
7 Tanenbaum A. S. , “Data Structures using ‘C’ ”

Subject Name: Data Structures in C++ Lab

UNIT I

Lab Sheet 1:

Q1. Write a program in C++ to insert, delete and update the contents of an array. Q2. Write a program in C++ to perform various operations on matrices.
Q3. Write a program to multiply two sparse matrices?
Q4. Write a program in C++ to implement different string manipulation operations?

Lab Sheet 2:

Q1. Write a program to implement singly linked list?
Q2. Write a program to implement different operations like adding a node at beginning, end, center, after a certain element, after a certain count of nodes in a linkedlist.
Q3. Write a program to implement different operations like deleting a node at beginning, end, center, after a certain element, after a certain count of nodes in a linkedlist.
Q4. Write a program in C++ to reverse a linked list by changing the link in the nodes? Q5. Write a program to add two polynomials represented as linked list?

Lab Sheet 3:

Q1. Write a program in C++ to multiply two polynomials represented as linked lists? Q2. Write a program in C++ to implement a doubly linked list?
Q3 Write a program to implement different operations like adding a node at beginning, end, center, after a certain element, after a certain count of nodes in a doubly linkedlist.
Q4. Write a program to implement different operations like deleting a node at beginning, end, center, after a certain element, after a certain count of nodes in a doubly linkedlist.
Q5 Write a program to implement different operations of a circular linked list

UNIT II

Lab Sheet 1:

Q1. Write a program to implement various operations on an array based stack?
Q2. Write a program to implement various operations on an stack represented using linked list. Q3. Write a program to demonstrate the use of stack in checking whether the arithmetic expression is properly parenthesized?
Q4. Write a program to demonstrate the use of stack in converting an arithmetic expression from infix to postfix?
Q5. Write a program to demonstrate the use of stack in evaluating an arithmetic expression in postfix notation?

Lab Sheet 2:

Q1. Write a program to demonstrate the use of stack in implementing quicksort algorithm to sort an array of integers in ascending order?
Q2. Write a program to demonstrate the implementation of various operations on a linear queue represented using a linear array.

Q3. Write a program to demonstrate the implementation of various operations on a Circular queue represented using a linear array.

Lab Sheet 3:

Q1. Write a program to demonstrate the implementation of various operations on a queue represented using a linked list?

Q2. Write a program to demonstrate the use of multiple stacks?

UNIT III

Lab Sheet 1:

Q1. Write a program in C++ to create a binary tree?
Q2. Write a program to implement the traversal techniques of a binary tree?

Lab Sheet 2:

Q1. Write a program to delete a node in a binary search tree?
Q2. Write a program to implement the different operations of an AVL tree?
Q3. Write a program to implement the different operations of a threaded binary tree. Q4. Write a program to implement the different operations of a M-way search tree?

Lab Sheet 3:

Q1. Write a program to implement the different operations of a B- tree?
Q2. Write a program in C++ to implement the different operations of a B+tree? Q3. Write a program in C++ to implement the different operations of a B* tree? Q4. Write a program in C++ to Multi-dimensional binary searchtrees.
Q5.Write a program in C++ to implement the graph using different representations?
Q6. Write a C++ program to illustrate the traversal of a graph using Breadth FirstSearch? Q7. Write a C++ program to illustrate the traversal of a graph using Depth FirstSearch?

UNIT IV

Lab Sheet 1:

Q1. Write a program in C++ to find the edges of a spanning tree using Prims Algorithm?
Q2. Write a program in C++ to find the shortest path in a graph using Warshalls Algorithm.
Q3. Write a C++ program to in C++ to find the shortest path in a graph using Modified Warshalls Algorithm.
Q4. Write a C++ program to in C++ to find the shortest path in a graph using Dijkstra's Algorithm.
Q5. Write a C++ program in C++ to implement Euler Graphs?

Lab Sheet 2:

Q1. Write a program in C++ to implement Hamilton Graphs? Q2. Write a program in C++ to implement Planner Graphs?

Q3. Write a program to C++ to implement Kruskals Algorithm? Q4. Write a program to C++ to find the cycles in a graph?

Lab Sheet 3:

Q1. Write a C++ program to implement various hashing techniques? Q2. Write a C++ program to demonstrate the concept of rehashing? Q3. Write a C++ program to create Max and Min heaps?

Q4. Write a C++ program to create Binomial and Leftist heaps?

Subject Code: MCA21202CR
Subject Name: Python

Unit I

Understanding Python variables, Python basic Operators, python blocks , Data Types, Declaring and using Numeric data types: int, float, complex Using string data type and string operations[**4L**]

Defining list and list slicing Use of Tuple data type: Python Program Flow Control Conditional blocks using if, else and elif Simple for loops in python, For loop using ranges[**4L**]

String, list and dictionaries Use of while loops in python Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block [**4L**]

Unit II

Python Functions, Modules And Packages, Organizing python codes using functions[**4L**]

Organizing python projects into modules, Importing own module as well as external modules[**4L**]

Understanding Packages Powerful Lamda function in python, Programming using functions, modules and external packages, Python String, List And Dictionary Manipulations. [**4L**]

Textbook

- Kenneth A. Lambert, The Fundamentals of Python: First Programs, Cengage Learning, ISBN: 978-1111822705.

Reference Books:

1. David Beazley , Brian K. Jones “Python Cookbook”, 3rd Edition. O’Reilly Publications
2. Jake VanderPlas “Python Data Science Handbook” O’Reilly Publications
3. David Beazley, “Python Essential Reference (4th Edition) “ Addison Wesley
4. Vernon L. Ceder,” The Quick Python Book, Second Edition”, Manning Publications
5. Brett Slatkin ,”Effective Python”

Subject Code: MCA21203CR
Subject Name: Artificial Intelligence

Unit I [10L]

Introduction and historical perspective, Turing Test.
Expert Systems, Forward chaining, backward chaining, Conflict Resolution. **[4L]**
Agents: Intelligent agents, Agents and Environment, Structure of Agents **[3L]**
Knowledge Representation: Propositional Logic, First Order Logic, Inference in First Order Logic, Prepositional Versus First Order Logic **[3L]**

Unit II [10 L]

Fuzzy Logic, Fuzzification, Fuzzy Sets, Operations on Fuzzy Sets, Hedges, Reasoning in Fuzzy Logic-Mamdani Inference **[5L]**
Search Algorithms – Local search algorithms: Gradient ascent, Simulated Annealing, Genetic Algorithm **[5L]**

Unit III [10 L]

Inductive Learning: Inductive learning algorithms. Categories of inductive learning algorithms.
Rule extraction with inductive learning algorithms, Decision trees, ID3 algorithm. AQ algorithm, SAFARI algorithm [5L]
Applications of Inductive Learning **[3L]**
Machine Learning: Supervised, Unsupervised and Reinforcement Learning **[2L]**

Unit IV [10 L]

Neural Networks: Neuron as a basic building element of an ANN. Activation functions, Perceptron.
Learning with a perceptron. Limitations of a perceptron. **[3L]**
Multilayer Neural Networks, Training by Error Back Propagation [3L]
Self Organising Nets, Kohonen Self-Organising Net [2L]
Convolutional Neural Networks [2L]

Text Book:
Artificial Intelligence – A Modern Approach, Stuart Russel, Peter Norvig, PHI/Pearson Education.
References:

Machine Learning by Tom M. Mitchel, McGraw-Hill publication
Introduction to Machine Learning by EthemAlpaydin, The MIT Press.
Artificial Intelligence and Expert Systems by Patterson PHI
Advances in Deep Learning by M. Arif Wani, Springer

Course Name: Artificial Intelligence Lab

Unit I

Lab Sheet 1

1. Build an expert system and demonstrate forward chaining inferencing.

Lab Sheet 2

1. Build an expert system and demonstrate backward chaining inferencing.

Lab Sheet 3

1. Build an expert system and demonstrate conflict resolution process.

Unit II

Lab Sheet 1

1. Build a Fuzzy inference system for the Tipping Problem

Lab Sheet 2

1. Using Fuzzy Logic solve the following Tipping problem:

Given two sets of numbers between 0 and 5 (where 0 is for very poor, and 5 for excellent) that respectively represent quality of service and quality of food at restaurant, what should tip be?

Lab Sheet 3

1. Solve 2-input 1-output project risk prediction problem using Mamdani Inference. Make necessary assumptions.

Unit III

Lab Sheet 1

1. Create a decision tree for a given dataset using ID3 algorithm

Lab Sheet 2

1. Implement Classification and Regression Tree (CART) algorithm for any relevant dataset.

Lab Sheet 3

1. Demonstrate inductive learning on any application of your choice.

Unit IV

Lab Sheet 1

1. Implement single layer perceptron.

Lab Sheet 2

1 Demonstrate Neural Networks using different activation functions

Lab Sheet 3

1. Implement Back-propagation Algorithm

Subject Code: MCA21204CR
Subject Name: Software Engineering

UNIT I

Concept and Nature of Software, Software Crisis, Software Engineering – Concept, Goals and Challenges, Software Engineering Approach; [2L]

Software Development Process, Process Models - Waterfall Model, Evolutionary and Throwaway Prototyping Model, Incremental and Iterative Models, Spiral Model, Agile Process Model, Component based and Aspect Oriented development. [4L]

Software Process and Project Measurement: Measures, Metrics and Indicators, Size -Oriented Metrics vs. Function - Oriented Metrics, Capability Maturity Model Integration (CMMI). COCOMO Model. [4L]

UNIT II

Introduction to Requirements Engineering - Why, What and Where. Requirements Types: functional and nonfunctional requirements. [3L]

Requirement Engineering Framework. Requirement Elicitation Process and Techniques. Requirement Analysis and Modelling, Requirements prioritization, verification, and validation. [7L]

UNIT III

Basics of Design Engineering - Abstraction, Architecture, Patterns, Separation of concerns, Modularity, Functional Independence, refinement, Refactoring. [2L]

Function oriented design, Design principles, Coupling and Cohesion, Design Notations & Specifications, Structured Design Methodology. [4L]

Object-Oriented Design - Design Concepts, Design Methodology, Object-oriented analysis and design modeling using Unified Modeling Language (UML), Dynamic & Functional Modeling, Design Verification. [4L]

UNIT IV

Software Testing – Concepts, Terminology, Testing & Debugging, Adequacy Criteria, Static vs. Dynamic Testing, Black Box vs. White Box Testing. Structural testing and its techniques. Functional Testing and its techniques, Mutation testing, Random Testing. Non-Functional Testing like Reliability, Usability, Performance and Security Testing. [6L]

Introduction to Software Reliability: Basic Concepts, Correctness Vs Reliability, Software Reliability metrics, Operational Profile, Reliability Estimation and Predication, Reliability and Testing. [3L]

Concept of Software reengineering, reverse engineering and change management. [1L]

Text Book:

1. Pfleeger and Atlee, Software Engineering: Theory and Practice, 4th Edition, Pearson, 2010.

Reference Books:

2. Sommmerville, Ian - Software Engineering. Pearson , 9/e , 2011.
3. Pankaj Jalote - An Integrated approach to Software Engineering, Narosa Publication.
4. Software Engineering: Principles and practice, 3rd Edition, Hans Van Vliet, Wiley.
5. James F. Peters Software Engineering – An Engineering Approach, Wiley& Sons.
6. Roger Pressman, Software Engineering: A Practitioners Approach",McGraw-Hill Publications.

Tutorials for MCA21204CR (Software Engineering)

UNIT I

Tutorial #1

a. How is Software Engineering different from other Engineering fields?
b. Study and compare different software process models
c. Identify the suitable applications for the individual process model.

Tutorial #2

a. Calculate the function points for the following data. The total CAV is 36.

Number of user inputs=15 - Simple:- 5, Average:- 7, Complex:- 3
Number of user outputs=14 - Simple:- 5, Average:- 5, Complex:-4
Number of user inquiries=8 - Simple:- 2, Average:- 3, Complex:- 3
Number of files =6 - Simple:- 3, Average:- 1, Complex:- 2
Number of external interfaces=13 - Simple:- 4, Average:- 7, Complex:- 2

b. Based on the result calculate the various metrics like productivity, Quality, Cost, Documentation.

Tutorial #3

a. Calculate the effort, duration and average persons required for basic CoCoMo model for 70000 LOC assuming project type is semi-detached.

b. Calculate the effort, duration and average persons required for intermediate CoCoMo model for 50000 LOC assuming project type is organic and EAF is 2.92.

c. Calculate the effort, duration and average persons required in basic CoCoMo model for organic project type given that total FP is 651 and the 1 FP=2500 LOC

UNIT II

Tutorial #1

a Identify the different requirements of the application for application like Library Management System.
b. Identify the different requirements of the application for application like University System.

Tutorial #2

a Classify the requirements into functional and non-functional requirements for Library Mgmt. System.
b. Classify the requirements into functional and non-functional requirements for University System.

Tutorial #3

a. Prepare a requirement document (SRS) for the same as per the IEEE standard for Library Mgmt. System.
b. Prepare a requirement document (SRS) for the same as per the IEEE standard for university System.

UNIT III

Tutorial #1

Which of the following design principle(s) have been violated in the following scenarios?

a) Abstraction
b) Decomposition and Modularization
c) Coupling & Cohesion
d) Encapsulation
e) Sufficiency, Completeness and Primitiveness

f) All

i. An algorithm documented as part of design is not understandable by the programmers
ii. Important information of a module is directly accessible by other modules.
iii. Too many global variables in the program after implementing design.
iv. Unfulfilled requirements in the code after the design has been implemented.
v. Code breaks in unexpected places.
vi. All data of all classes in public.
vii. Cyclic dependencies among classes
viii. Huge class doing too many unrelated operations.
ix. Several unrelated functionalities/tasks are carried out by a single module.

Tutorial #2

Design the system using structured design for Library Management System by using DFD, ER diagrams and structure chart whichever applicable.

i. Identify various processes, data store, input, output etc. of the system.
ii. Use processes at various levels to draw the DFDs.
iii. Identify various modules, input, output etc. of the system
iv. Use various modules to draw structured charts.

Tutorial #3

Design the system using Object-Oriented design for Library Management System using UML modeling technique appropriately and

i. Identify various processes, use-cases, actors etc. of the system.
ii. Identify various elements such as classes, member variables, member functions etc. of the class diagram. Draw the class diagram.
iii. Identify various elements such as various objects of the object diagram. Draw the object diagram.
iv. Identify various elements states and their different transition of the state-chart diagram. Draw the state-chart diagram.
v. Identify various elements such as controller class, objects, boundaries, messages etc. of the sequence diagram. Draw the sequence diagram as per the norms.
vi. Identify various elements such as for the sequence diagram of the collaboration diagram. Draw the collaboration diagram as per the norms
vii. Identify various elements such as different activity their boundaries etc. of the activity diagram. Draw the activity diagram.
viii. Identify various elements of the component diagram such as the various components like client, server, network elements etc. Draw the component diagram.
ix. Identify various elements such as the hardware components of the deployment diagram. Draw the deployment diagram.

UNIT IV

Tutorial #1

a. Write test cases for login page of your university admission system.
b. Write test cases for simple calculator program.
c. Write test cases for online examination module.

Tutorial #2

Due to surge in online examination requirements, a company is intending to test its software capable of examining 5000 students at a time for MCQs. Indicate the performance testing strategy required to ensure that it is capable of supporting 5000 simultaneous users.

Tutorial #3

a. Calculate the reliability of the software product using sample data.
b. Calculate various reliability metrics using sample data and discuss applicability of each metric.

Discipline Centric Elective Courses

Subject Code: MCA21205DCE
Subject Name: Web Programming

Unit I

Adobe Photoshop Environment, Interface tour of Photoshop and Palettes, Color Modes and Resolutions, Using different Photoshop tools. [3L]

Working with Layers Grouping and Smart objects, Image Adjustments, Layer Masking and Layer Clipping, Using Blending Options, Filters, Photoshop actions, Animation tools [3L]

Markup Language, Basic Structure of HTML , Meta Tags, Document Structure Tags, Formatting Tags, Text Level formatting, Block Level formatting, List Tags, Hyperlink tags, Image and Image maps, Table tags, Form Tags, Executable content tags, Tables as a design tool, Forms, Creating Forms.[4L]

Unit II

Style Sheets: Different approaches to style sheets, Using Multiple approaches, Linking to style information in s separate file, Setting up style information. [4L]

Java Script: JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, Logical Operators, String Operators, Special Operators, ? (Conditional operator), ,(Comma operator), delete, new, this, void Statements : Break, comment, continue, delete, do … while, export, for, for…in, function, if…else, import, labelled, return, switch, var, while, with, Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp Document Object Model, Events and Event Handlers.[6L]

Unit III

PHP, Server-side web scripting, Installing PHP, Adding PHP to How PHP scripts work, Basic PHP syntax PHP data types, PHP Variables, Operators in PHP, Conditional Statements, Loops (If, If else and Switch) [4L]

Strings, Arrays and Array Functions, Numbers, PHP Function: User-Defined Functions, Inbuilt functions, Basic PHP errors / problems, Working with Forms, designing a Form, $_GET and $_POST, HTML and PHP code, User Input, Form Validation, Cookies, File uploading, Sessions [6L]

Unit IV

Advanced PHP and MySQL: PHP MySQL Integration, Creating a database connection, Selecting the DB, Basics of SQL, SQL Syntax, CRUD Operations, Inserting data in database, Inserting data with a File [5]

Retrieving data from Database, Retrieving data with specific criteria, Updating records, Searching the records, Alter table structure, Deleting the records Dropping tables. Emailing with PHP. [5]

References:

1. Web Design The complete Reference, Thomas Powell, Tata McGrawHill
2. HTML and XHTML The complete Reference, Thomas Powell, Tata McGrawHill
3. JavaScript 2.0 : The Complete Reference, Second Edition by Thomas Powell and Fritz Schneider
4. PHP: The Complete Reference By Steven Holzner, Tata McGrawHill

Subject Name: Web Programming Lab

Unit I

Week 1:

1. Open any picture and make use of rectangular and elliptical selection tools to select portions of the image and paste it in another image. Also make use of move tools.
2. Make use of the Lasso- and Polygonal Lasso Selection Tools, Copy, Paste Into, Move Tool, Zoom Tool, Quick Select Tool (or Magic Wand Tool), Invert Selection, Copy, Paste Transform tools for editing an image.
3. Edit any image using the following tools, Paint Bucket Tool, Color Picker, Brush Tool.
4. Select an image and make use of Text Tool, Selection Tools, Copy, Paste, Transform, Move Tool, Opacity, Eraser Tool to perform different operations
5. Select any image of your choice and make use of the Brush Tool, Smudge Tool, Dodge Tool, Burn Tool, Layer Styles, Modes, The Shape Tools, the Styles palette.

Week 2

1. Applying different filters on an image and make use of different layers.
2. Create a page banner from scratch using browser-safe colors
3. Make the illusion of an image fitting inside your text using clipping mask.
4. Create an Animation for Rocket Launch and Moving Ball

Week 3

1. Create a html page with demonstrates the use of formatting tags image tags and other basic tags.
2. Create the different types of list, tables in html
3. Create a table with the relevant tags and attributes
4. Create a html form in the table layout covering major form elements

Unit II

Week 4

1. Link an external style sheet with styles for basic tags.
2. Create a CSS code for applying design on the webpage.
3. Using a DIV tag and CSS code design a web page.
4. Create a CSS code and use id and Class identifiers.

Week 5

1. Write a JavaScript program to sum the multiples of 3 and 5 under 1000?
2. Write a JavaScript Code for checking type of triangle where three sides are given.
3. Write a JavaScript code to convert a Decimal Number int Roman Number?
4. Write a JavaScript function to test whether a string ends with a specified string

Week 6

1. Write a JavaScript to check whether a given string is palindrome or not.
2. Write a program using Java Script that checks if two matrices have identical values in all the elements
3. Write a JavaScript program to check a credit card number and validate an email address using JavaScript Regular Expressions?
4. Write a JavaScript program to implement DOM?

Unit -III

Week 7

1. Create a simple HTML form and accept the user name and display the name through PHP echo statement
2. Write a PHP program to remove duplicates from a sorted list.
3. Write a PHP program to compute the sum of the prime numbers less than 100
4. Write a PHP program to print out the sum of pairs of numbers of a given sorted array of positive integers which is equal to a given number?

Week 8

1. Write a program to calculate and print the factorial of a number using a for loop.
2. Write a PHP script using nested for loop that creates a chess board?
3. Write a program that inputs a number from the user and display all armstong numbers upto the number entered using loops?
4. Write a function to reverse a string.

Week 9

1. Write a PHP code to Validate and form and provide results on the other web page
2. Wite a PHP code to implement various string functions used in PHP.
3. Write a PHP code for uploading a file in a specific folder on the server.
4. Write a PHP code so sort an array using any sorting technique?

Week 10

1. Write a PHP script to get time difference in days and years, months, days, hours, minutes, seconds between two dates
2. Write a PHP function to get start and end date of a week (by week number) of a particular year
3. Write a PHP script to generate random 11 characters string of letters and numbers
4. Write a PHP function to create a human-readable random string for a captcha.

Unit - IV

Week 11

1. Write the mysql code to create the database represented by following E-R diagram . Keep all the referential integrity constraints into consideration?
2. Insert the dummy data inside the tables making any assumptions as required if any ?
3. Write a SQL statement to insert records into the table countries to ensure that the country_id column will not contain any duplicate data and this will be automatically incremented and the column country_name will be filled up by 'N/A' if no value assigned for that column.
4. Write a SQL statement to insert rows in the job_history table in which one column job_id is containing those values which are exists in job_id column of jobs table.
5. Write a SQL statement to insert rows into the table employees in which a set of columns department_id and manager_id contains a unique value and that combined values must have exists into the table departments.
6. Write a SQL statement to insert rows into the table employees in which a set of columns department_id and job_id contains the values which must have exists into the table departments and jobs.

Week 12

1. Write a query to display the name (first_name, last_name) and salary for all employees whose salary is not in the range $10,000 through $15,000.
2. Write a query to display the name (first_name, last_name) and salary for all employees whose salary is not in the range $10,000 through $15,000 and are in department 30 or 100.
3. Write a query to display the first_name of all employees who have both "b" and "c" in their first name.
4. Write a query to get the total salaries payable to employees.
5. Write a query to get the minimum salary from employees table.
6. Write a query to get the maximum salary of an employee working as a Programmer.
7. Write a query to get the average salary and number of employees working the department 90.
8. Write a query to find the name (first_name, last_name) and hire date of the employees who was hired after 'Jones'.
9. Write a query to get the department name and number of employees in the department
10. Write a query to find the employee ID, job title, number of days between ending date and starting date for all jobs in department 90.
11. Write a query to display the department ID and name and first name of manager.
12. Write a query to display the department name, manager name, and city.
13. Write a query to display the job title and average salary of employees.
14. Write a query to display job title, employee name, and the difference between salary of the employee and minimum salary for the job
15. Write a query to get the DATE value from a given day (number in N).
16. Write a query to get the firstname, lastname who joined in the month of June.
17. Write a query to get the years in which more than 10 employees joined.
18. Write a query to get first name of employees who joined in 1987.
19. Write a query to get department name, manager name, and salary of the manager for all managers whose experience is more than 5 years.
20. Write a query to get employee ID, last name, and date of first salary of the employees.
21. Write a query to get first name, hire date and experience of the employees
22. Write a query to get the department ID, year, and number of employees joined.
23. Write a query to update the portion of the phone_number in the employees table, within the phone number the substring '124' will be replaced by '999'.
24. Write a query to get the details of the employees where the length of the first name greater than or equal to 8.
25. Write a query to display the first word from those job titles which contains more than one words
29. Write a query to display the first eight characters of the employees' first names and indicates the amounts of their salaries with '$' sign. Each '$' sign signifies a thousand dollars. Sort the data in descending order of salary.
26. Write a query to display the employees with their code, first name, last name and hire date who hired either on seventh day of any month or seventh month in any year

Week 13.

1. Create a PHP-MySQL connection which connects to the hr database using PHP objects ?
2. Create a form to add using sign in and sign out, update and delete employee to the hr database?
3. Create a login, logout for every employee and list all the employee in the database?
4. Write a php script which emails the login details to the new employee along with his salary details fetch from the hr database?
5. Write a php script which demonstrates the use of sessions and cookies which inserting in the database?

Subject Code: MCA21206DCE
Subject Name: Cryptography and Network Security

Unit 1:

Part 1: The OSI Security Architecture, Security Attack – Threats, Vulnerabilities, and Controls, Types of Threats (Attacks) [3L]

Part 2: Security Services – Confidentiality, Integrity, Availability, Authentication, Access Control and Non-repudiation; Security Mechanism. [3L]

Part 3: Introduction to Number Theory: Prime Number Generation and Testing for Primality, Fermat's and Euler's Theorems, Modular Arithmetic, Euclidean and Extended Euclidean Algorithm, Euler's Phi Function. [4L]

Unit 2:

Part 1: Introduction to Cryptology. Types of Encryption Systems – Based on Key, Based on Block; Confusion and Diffusion; One-time pad, Block Ciphers and Data Encryption Standard [4L]

Part 2: Block Cipher Modes of operation, Advanced Encryption Standard. Stream Ciphers, Random Number Generation. Shift Register based stream Ciphers, RC4 [4L]

Part 3: Public-Key Cryptography. RSA Cryptosystem [2L]

Unit 3:

Part 1: Double and Triple Encryption. Key Management, Diffie-Hellman Key Exchange [2L]

Part 2: Digital Signatures, The RSA signature scheme, Hash Functions, The Secure Hash Algorithm SHA-1 [4L]

Part 3: Message Authentication Codes, HMAC and CBC-MAC, Message Digest [4L]

Unit 4:

Part 1: IP Security, Authentication Header, Encapsulating Security Payload, Electronic Mail Security [4L]

Part 2: Network intrusion Detection system using machine learning: Supervised and Unsupervised. General IDS model and Taxonomy. IDS Signatures. [3L]

Part 3: DDoS Attacks. Specification and rate based DDoS. Defending against DoS attacks in scout: signature based solutions. [3L]

References

- Paar, Christof, and Jan Pelzl. *Understanding cryptography: a textbook for students and practitioners*. Springer Science & Business Media, 2009.
- William, S., and Cryptography Stalling. "Network Security, 4/E." Prentice Hall. (2006).
- Forouzan, Behrouz A., and Debdeep Mukhopadhyay. *Cryptography and network security (Sie)*. McGraw-Hill Education, 2011.
- Endorf, C., Schultz E and Mellander J, "Intrusion Detection and prevention". McGraw Hill. 2003

Cryptography and Network Security (LAB)

Unit I

Week 1: Network Troubleshooting commands

a. Ipconfig, Ping, Traceroute, Netstat
b. NSLookUp, ARP, Hostname

Week 2: Demonstrate Packet Sniffing and Analysis of Network Traffic

a. Analyse Network Traffic using Wireshark
b. Demonstrate the Analysis of Network traffic over HTTP protocol

Week 3: Demonstrate Network Penetration Testing

a. Demonstrate use of various Network Penetration testing tools
b. Use Hashcat to crack hashes on passwords.

Unit II

Week 4:Substitution Ciphers

a. Discuss in detail working of Substitution based cryptographic Primitives
b. Implement Caesar Cipher Encryption Decryption

Week 5:Polyalphabetic Substitution Ciphers

a. Demonstrate Symmetric Digraph Substitution
b. Implement Playfair Cipher and Vigenere Encryption Decryption

Week 6: Transposition Cipher

a. Demonstrate Transposition ciphers.
b. Implement Vigenere Cipher and Rail Fence (Row Column Transformation)

Unit III

Week 7: Asymmetric Key Cryptography

a. Discuss the implementation of Public key Cryptography
b. Implement RSA Algorithm

Week 8: Symmetric Key Cryptography with Stream Ciphers

a. Demonstrate working of Stream Ciphers
b. Implement RC4 Algorithm

Week 9: Symmetric Key Cryptography with Block Ciphers

a. Discuss in detail the implementation details of Block Ciphers
b. Implement DES Algorithm

Unit IV

Week 10: Intrusion Detection

a. Demonstrate Anomaly Detection and its various types
b. Perform Intrusion Detection System using SNORT

Week 11: IDS using Machine learning Algorithms

a. Discuss Various classifiers for Intrusion Detection
b. Implement IDS using Random Forest on NSL KDD DataSet.

Week 12: Network Testing

a. Discuss Security Auditing and Network Discovery
b. Implement Vulnerability Scanning using NMAP tool

Software's / Tools Required.

1. **Wireshark**
2. **SNORT**
3. **Net Stumbler**
4. **NMAP**
5. **Python**
6. **Hashcat**
7. **Turbo C/ JAVA / Python**

Subject Code: MCA21207DCE
Subject Name: Computer Graphics & Multimedia

Unit I: [10L]

Introduction to Computer Graphics, Applications of Computer Graphics, Graphic Display Devices: Refresh Cathode Ray Tubes, Raster-scan Displays, Random-Scan displays, Color CRT Monitors, Concept of Double Buffering, Lookup tables (4L)

2-D Graphics: Cartesian and Homogeneous Coordinate Systems, Line drawing algorithms (Bressenham's and DDA), Circle and Ellipse Drawing Algorithms (6L)

Unit II: [10L]

2-Dimensional Transformations, Concepts of Window & Viewport, Window to Viewport Transformations, Normalization transformation (3L)

Composite Transformations: General pivot point rotation, General fixed point scaling, reflection w.r.t line $y=x$, reflection w.r.t line y=x (4L)

Transformation between coordinate systems, affine transformations, Raster methods for transformations (3L)

Unit III: [10L]

Filling, Boundary and Flood-fill algorithms (2L)

Clipping, Line Clipping Algorithms (Cohen-Sutherland Algorithm), 3-D Graphics, Projections: perspective and parallel projection transformations. (5L)

3-Dimensional Transformations, Hidden Surface Removal Techniques, Z-Buffer Algorithm, Back Face Detection (3L)

Unit IV: [10L]

Curves and Surfaces: Spline specification, Interpolated& Approximated Splines. Bezier Splines, Bezier Curves, Cubic Bezier Curves, Bezier Surfaces. (3L)

Introduction to Multimedia, Visual elements: BMP file format, PCX file format, WAV and MP3 file format; Sound elements; Multimedia Storage- Compact disk (CD) and Digital Versatile Disk(DVD) (7L)

Text Book:

1. Hearn and Baker "Computer Graphics" 2nd Edition, Pearson Education.

Reference Books

1. W.M.Newman and Sproull. "Principles of interactive Computer Graphics" ,TMH
2. Steven Harrington." Computer Graphics a Programming Approach" McGraw Hill.
3. Plastock and Kelley. "Schaums outline of theory and problems of computer Graphics"
4. David F Frogers and J Alan Adams. "Procedural Elements of Computer Graphics" McGraw Hill
5. David F Rogers and J Alan Adams. "Mathematical Elements of Computer Graphics" McGraw Hill
6. James. D. Foley, A Van dam etal "Computer Graphics" Pearson.
7. Sinha and Udai , "Computer graphics", TMH

Subject Name: Computer Graphics & Multimedia Lab

Lab Sheet 1
Unit I:

Q1. Write a C++ program to draw line.
Q2. Write a C++ program to draw circle.
Q3. Write a C++ program to draw pixel.

Lab Sheet 2
Unit I:

Q1. Write a C++ program to draw line using DDA algorithm.
Q2. Write a C++ program to implement Brenham's algorithm to draw line.

Lab Sheet 3
Unit I:

Q1. Write a C++ program to implement Mid-Point Algorithm to draw Circle.
Q2. Write a C++ program to implement Mid-Point Algorithm to draw Ellipse.

Lab Sheet 1
Unit II:

Q1. Write a program to apply Translation to 2D shapes
Q2. Write a program to apply Scaling to 2D shapes
Q3. Write a program to apply reflection along X axis to 2D shapes
Q4. Write a program to apply reflection along Y axis to 2D shapes
Q5. Write a program to apply translation and reflection to 2D shapes

Lab Sheet 2
Unit II:

Q1. Write a program to apply rotation to 2D shapes
Q2. Write a program to apply X-shearing to 2D shapes
Q3. Write a program to apply Y-shearing to 2D shapes
Q4. Write a program to apply reflection along y=x line to 2D shapes
Q5. Write a program to apply translation and shearing to 2D shapes

Lab Sheet 3
Unit II:

Q1. Write a program to apply reflection along y=-x line to 2D shapes
Q2. Write a program to apply translation and rotation to 2D shapes
Q3. Write a program to apply scaling and shearing to 2D shapes
Q4. Write a program to apply scaling and translation to 2D shapes
Q5. Write a program to apply scaling and reflection to 2D shapes

Lab Sheet 1
Unit III:

Q1. Write a program to apply composite scaling and rotation to 2-Dimensional shapes.
Q2. Write a program to apply composite translation and rotation to 2-Dimensional shapes.
Q3. Write a program to clip the lines fallen outside the window using Cohen Sutherland line clipping.

Lab Sheet 2
Unit III:

Q1. Write a program to apply scaling and rotation to 3-Dimensional shapes.
Q2. Write a program to apply scaling and translation to 3-Dimensional shapes.
Q3. Write a program to apply translation and rotation to 3-Dimensional shapes.

Lab Sheet 3
Unit III:

Q1. Write a program to apply composite scaling and rotation to 3-Dimensional shapes.
Q2. Write a program to apply composite translation and rotation to 3-Dimensional shapes.
Q3. Write a program to apply composite translation and scaling to 3-Dimensional shapes.

Lab Sheet 1
Unit IV:

Q1. Write a program to implement line attributes.
Q2. Write a program to implement circle attributes.
Q3. Write a program to implement ellipse attributes.

Lab Sheet 2
Unit IV:

Q1. Write a program to draw Bezier Curve.
Q2. Write a program to draw Cubic Bezier Curve.

Lab Sheet 3
Unit IV:

Q1. Write a program to draw Bezier surfaces.
Q2. Write a program to generate fractal images.

MCA21201OE
Web Designing

Unit-I

HTML: Understanding HTML, create a Web Page, Linking to other Web Pages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, Hyper Links and link within a Page, Creating HTML Forms, Creating Web Page Graphics, Putting Graphics on a Web Page, Custom Backgrounds and Colors.

Unit-II

Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), Working with block elements and objects, Working with Lists and Tables, CSS Id and Class, Box Model (Introduction, Border properties, Padding Properties, Margin properties), Creating page Layout and Site Designs.

Semester – III

Subject Code: MCA21301CR
Subject Name: Design and Analysis of Algorithms

Unit I:

Introduction to Algorithms, Analysis of Algorithms, Growth of Functions, Asymptotic notations (3L) Recurrences, Substitution method, Iteration method, Recursion trees (4L) The Master Method, Time and Space Complexity study of some basic algorithms. (3L)

Unit II:

Randomized Algorithms: Identifying the repeated element, Primality testing, Advantages and Disadvantages. (3L) Divide and Conquer Strategy: Binary search, Quick sort, Merge sort (3L) Greedy Method, General method, Knapsack problem, Single source shortest paths.(4L)

Unit III:

Dynamic programming Strategy: All pair shortest paths, Traveling salesman problems. (3L) Backtracking Strategy: 8-Queen problem, Sum of subsets, Knapsack problem.(4L) Branch and Bound Strategy: Least Cost Branch and Bound, 8-Queen Problem(3L)

Unit IV

Lower boundary theory, Lower bound theory through reductions, P and NP problems. NP hard and NP complete problems, Cook's Theorem (5L) Approximate Algorithms and their need, The vertex Cover Problem, The traveling salesman problem, The subset sum problem (5L)

Text Book:

1. Horowitz, Sahni, Rajasekaran "Fundamentals of Computer Algorithms", Galgotia Publications Reference Books:
1. Coremen, 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 Name: Algorithms Lab

Unit 1:
LabSheet1:

1. Write a program for Linear Search.
2. Implement recursive solution to the Tower of Hanoi puzzle.

LabSheet2:

1. Write a program for iterative binary search.
2. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n > 5000 and record the time taken to sort. Plot a graph of the time taken versus n on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C how the divide -and- conquer method works along with its time complexity analysis: worst case, average case and best case.

LabSheet3:

1. Print all the nodes reachable from a given starting node in a digraph using BFS method.
2. Obtain the Topological ordering of vertices in a given digraph

Unit 2:
LabSheet1:

1. Write a program for recursive binary search.
2. Write a program for Merge Sort.

LabSheet2:

1. Write a program for finding maximum and minimum number using Divide and conquer method.
2. Write a program to sort given set of elements using heap.

LabSheet3:

1. Implement Knapsack Problem using greedy method.
2. Write a program for Single Source Shortest path algorithm using greedy method.

Unit 3:
LabSheet1:

1. Implement 0/1 knapsack using dynamic programming.
2. Write a program for travelling salesman problem using Dynamic programming.

LabSheet2:

1. Implement BFS.
2. Implement DFS.

LabSheet3:

1.Write C programs to implement All-Pairs Shortest Paths problem using Floyd's algorithm.
2. Implement 8-Queens problem and analyze its time complexity.

Unit 4:

LabSheet1:

1. Implement N-Queens problem using Backtracking.
2. Write a program for Vertex Cover Problem..

LabSheet2:

1. Design and implement in C to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

LabSheet3:

1. Compute the transitive closure of a given directed graph using DFS.

Subject Code: MCA21302CR
Subject Name: Java Programming

Unit I [10L]

Introduction to Java Language: Creation of Java. How Java changed the Internet. Features of Java Language. Evolution of Java. Comparison with other languages like C++.Java Virtual Machine (JVM) and Byte-code.
Java Language Overview: Lexical issues – Whitespace, Identifiers, Keywords, Literals, Separators, and Comments. Installing JDK.PATH variable. Java program – Structure, Compilation and Execution. Java Class libraries (System Class).*main()* method.[3L]
Data types, Variables and Arrays: Primitive Data-types and Typed-Literals. Variables – Declaration, Initialization, Scope and Lifetime. Arrays – Single and Multidimensional. Type Conversion and Expression Promotion. [4L]
Operators, Expressions and Control statements: Arithmetic, Bitwise, Relational, Logical, Assignment. Precedence and Associativity. Selection, Iteration and Jump Statements.
[3L]

Unit II [10L]

Class Fundamentals: Class Structure (Variable and Method declaration).Modifiers (Access Modifiers and Other Modifiers).Components of Class, Variable and Method declaration. Constructor and *finalize()*. Garbage Collection. Passing parameters to methods. Variable hiding. Method overloading. Constructor overloading and chaining. Use of *this* keyword. Code blocks - Static and non-static.
[3L]
Inheritance: Mechanism. Role of Access Modifiers. Method Overriding and Shadowing. Use of *super* keyword. Polymorphism - Early and Late binding. Abstract Class and Interface. Components of Interface declaration. Implementing Interfaces.
[3L]
Exception Handling: Mechanism - Exception-Object, Throwing an Exception, and Exception Handler. Catch or Specify policy. Types of Exception - Checked vs Unchecked, Built-in vs User-defined. Catching an Exception - *try-catch-finally*. Specifying an Exception - *throws.* Manually throwing an Exception - *throw*. Custom Exceptions. Chained Exceptions. [4L]

Unit III [10L]

Packages: Creating and Importing Packages. CLASSPATH variable. *static import*. [2L]
Strings: Mutable and Immutable Strings. Creating Strings. Operations on Strings. [1L]
Threads: Creating Threads in Java. Java Thread Lifecycle. Multithreading in Java: Synchronization and Inter- process communication (IPC) in Threads. [4L]
Applet: Java Applet class Architecture. Working and Lifecycle of Java Applet. Displaying text and animation, and passing parameters to Applet. Embedding Applets in a web page. [3L]

Unit IV [10L]

Event-Driven Programming: Java 1.1 Event Delegation Model – Source object, Event object and Listener object. Methods associated with Source, Event and Listener objects. Low-level vs Semantic events. Adapter classes, Inner classes, and Anonymous Inner classes. Adding GUI elements to Applet.
[4L]
I/O Streams: Byte, Character, Buffered, Data, and Object Streams. Standard Streams. File I/O Basics, Reading and Writing to Files. Serializing Objects. [4L]
Networking Classes and Interfaces: TCP/IP Server Sockets in Java. Developing simple networking applications in Java like File transfer, Chatting, etc. [2L]

Textbook: H. Schildt, Java: The Complete Reference, 9th Edition, Tata McGraw Hill, 2014.
Reference Books:
5. K. Sierra, Sun Certified Programmer For Java 5, Wiley India, 2006.
6. K. Sierra and B. Bates, Head First Java (Java 5), 2nd Edition, O'Reilly, 2003.
7. H.M. Dietel and P.J. Dietel, Java: How to Program, 6th Edition, Pearson Education, 2007.
8. C.S. Horstmann and G. Cornell, Java 2 Vol-1 Fundamentals, 7th Indian Reprint, Pearson Education, 2006.
9. E. Balagurusamy, Programming with Java: A Primer, 4th Edition, Tata Mcgraw Hill, 2010.

Subject Name: Java Programming Lab

UNIT I

Lab Sheet 1:

Q1. Download latest version of Java Development Kit (JDK), preferably JDK8 or above (Please visit https://java.com/en/download/).
Q2. Follow the instructions that appear during the Installation ofJDK8, and set PATH variable to the appropriate directory location as instructed in the lecture.

Lab Sheet 2:
Q1. Write a Java program that displays "hello world!" on the screen.
Q2. Write a Java program that receives two integer numbers via keyboard, does their summation, and displays the result. Ensure that only integer values are processed.
Q3. Write a Java program that prints the season name corresponding to its month number using If-else and switch-case statements.
Q4. Write a Java program that sorts (using bubble sort) an integer array using for loop.
Q5. Write a Java program that calculates factorial of a number (inputted via keyboard) recursively.
Q6. Write a Java program that creates a 2D integer array with 5 rows and varying number of columns in each row. Using 'for each' variant of for loop display each element of every row.

Lab Sheet 3:
Q1. Write a Java program that reads an integer from keyboard and displays it.
Q2. Write a Java program that reads a floating-point number from keyboard, converts it to integer and displays it.
Q3. Write a Java program that reads a string from keyboard, converts it to a floating-point number and displays it.
Q4. Write a Java program that populates all the 10 elements of an integer array using keyboard input, increments every element by 1, and displays every element.
Q5. Write a Java program that iteratively calculates factorial of a number.

UNIT II
Lab Sheet 1:

Q1. Write a Java program that creates a Class, namely Student.
i. Ensure that Age instance variable of the Class is never accessed directly, and its value is never less than 4 and greater than 40 for any Object of the Class (use methods to validate and assign the value).
ii. Ensure that the constructor always assigns a unique value to Enrollment_No instance variable for every Object of the Class (use a static class variable for counting objects, say Object_Counter).
iii. Ensure that when an Object is removed, the Object_Counter is automatically decremented (use finalize()), and whenever required the variable can only be accessed using a method even without an Object reference (make the counter private and use a static method to access it).
Q2. Write a Java program in which a Class overloads a method sum(), which takes 2 parameters. The overloaded methods should perform summation of either integer or floating-point values.

Lab Sheet 2:

Q1. Write a Java program that creates a Class namelyA that has a private instance variable and method, a protected instance variable and method, a default instance variable and method, and a public instance variable and method. Create another Class say B that inherits from A.

i. Show that all except private members are inherited.

ii. Show that an inherited instance variable can be shadowed (with the same or weaker access visibility) but can be accessed using super keyword in the sub-class.

iii. Show that an inherited method can be overridden (with the same or weaker access visibility) but canbe accessed using super keyword in the sub-class.

iv. Show that the reference variable of type A or B can't access an overridden method of A in the Object of B.

v. Show that the reference variable of type A can access a shadowed data member of A in the Object of B.

Lab Sheet 3:

Q1. Write a Java program that creates a Class in which a method asks the user to input 2 integer values, and calls another member function (say div()) to divide the first inputted number by the second number (by passing them as parameters). Handle an exception that can be raised in div() when the denominator equals zero (use try-catch statement).

Q2. Modify the above Java program so that it also creates a Custom Exception that is thrown by div() when the denominator value is 1 (use throw). Handle the exception.

Q3. Modify the above Java program so that the exception-handling in not performed by div() rather it only species all the possible exceptions it may throw (use throws). And, the method that calls div() does the exception handling.

UNIT III

Lab Sheet 1:

Q1. Create a Java Package (say pack1) that contains 3 Classes (say A, B and C). Write a Java program that uses this package after setting the CLASSPATH variable. Following scenarios must be considered individually:

i. Importing the whole package (all the 3 classes)

ii. Importing only specific class (say Class A only)

Q2. Create another Package (say pack2) that contains same number of classes, and same definition for each class, as that of pack1. Write a Java program that imports all classes from both pack1 and pack2 while ensuring that the name conflicts are not encountered while accessing any of these classes.

Q3. Write a Java program to count the total number of occurrences of a given character in a string.

Q4. Write a Java program to convert a string to char array.

Lab Sheet 2:

Q1. Write a Java program that creates a Class that extends a Thread class. Create 3 objects of the class, each starting a new thread and each thread displaying "I am Thread: " in an infinite loop. The displayed text must be suffixed by the unique name of the thread.

Q2. Write a Java program that creates a Class that implements interface Runnable, and does the same as the above program.

Q3. Write a Java program to implement a solution for producer-consumer problem using synchronization and inter-process communication in Threads.

Lab Sheet 3:
Q1. Write a Java program that creates a Class that extends an Applet class. The applet is embedded in a web page and is passed 2 numeric parameters. The applet shall display the summation result of the parameters passed.

Q2. Write a Java program that creates a Class that extends an Applet class. The applet simulates a marquee by displaying characters of the message one at a time from right to left across the screen. When the message is fully displayed, the message starts again.
Q3. Write a Java program that creates a Class that extends an Applet class. The applet displays bar chart forthe data passed as parameter. The data includes the number of male and female students enrolled in MCA course.

UNIT IV
Lab Sheet 1:
Q1. Write a Java program that creates a Class that extends an Applet class. Add GUI elements to the applet so as to create a simple 2-player tic-tac-toe game.
Q2. Write a Java program that creates a Class that extends an Applet class. Add GUI elements to the applet so as to create a simple calculator.

Lab Sheet 2:
Q1. Write a Java program to open and read a file (filename is passed as command line argument), and displays the number of words in the file?
Q2. Write a Java program to copy a file. The source and destination filenames arepassed as command line arguments.

Lab Sheet 3:
Q1. Write a Java program (client) that sends a text message to another Java program (server), which receives and displays it.
Q2. Modify the above Java programs so that each of the two programs is able to send and receive the text messages.

Subject Code: **MCA21303CR**
Subject Name: OPERATING SYSTEMS

Unit - I

Types of Operating Systems; Operating System Structures – Processes, Scheduling criteria, Scheduling Algorithms. **5L**

Processor allocation and scheduling in distributed systems - System Models, Load balancing and sharing approach, fault tolerance; Real time distributed systems. 5L

Unit - II

Interprocess Communication and Synchronization, Classical problems, Critical section, Semaphores, Monitors. **5L**

Synchronization in Distributed Systems - Clock Synchronization and related algorithms, Logical Clocks.

Mutual Exclusion: Centralized & Distributed (Contention & Token) Algorithms. Election Algorithms: Bully Algorithm, Invitation Algorithm. **5L**

Unit - III

Memory Management: Address Spaces, Virtual Memory. Page Replacement Algorithms, Design and Implementation Issues for Paging Systems, Segmentation. **5L**

General architecture of Distributed Shared Memory systems; Design and implementation issues of DSM; granularity - Structure of shared memory space, consistency models, replacement strategy, thrashing. **5L**

Unit - IV

Deadlocks characterization, Methods for handling deadlocks. Deadlock - Prevention, Avoidance, Detection, Recovery. Deadlock Detection - Distributed Algorithms **5L**

Threads - Characteristics, Advantages & Disadvantages, Design Issues & Usage. Client Server model; Remote procedure call and implementation issues. **5L**

Text Books:

Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", John Wiley.
Pradeep K. Sinha , "Distributed Operating Systems : Concepts and Design", PHI

Reference Books:

Andrew .S. Tanenbaum, "Modern Operating Systems", PHI. Andrew. S. Tanenbaum, "Distributed Operating System", PHI.

Subject Name: OPERATING SYSTEMS LAB

UNIT I

Lab Sheet 1:

1. Write a program to implement process systemcalls.
2. Write a program to implement I/O systemcalls

Lab Sheet 2:

1. Write a program to simulate the SJF scheduling algorithm. The program should read the following inputs:

- Number of processes
- Burst time requirement of each process

The program should generate the following outputs:

- Process statistics after each context switch
- Average Turn around time
- Average Waiting time

2. Write a program to simulate the Round Robin scheduling algorithm. The program should read the following inputs:

- Number of processes
- Burst time requirement of each process
- Length of the Time Slice

The program should generate the following outputs:

- Process statistics after each context switch
- Average Turn around time
- Average Waiting time

Lab Sheet 3:

1. Write a program to simulate FCFS scheduling algorithm.
2. Write a program to simulate priority schedulingalgorithm.

Unit II

Lab Sheet 1:

1. Write a program to implement the producer – consumer problem using semaphores.
2. Write a program to implement IPC using shared memory.
3. Write a program to simulate the concept of dining philosophers problem.

Lab Sheet 2:

1. Create client server programs using RPC wherein the server accepts a number from the client and returns the square of the number which is then displayed by the client. Use rpcgen to generate the stubs automatically.

2. Write a program to simulate Clock Synchronization in Distributed Systems using Lamport's Algorithm.

Lab Sheet 3:

1. Write a program to simulate the Bully Election algorithm.

UNIT III

Lab Sheet 1

1. Write a program to implement and simulate MFT (Memory management with fixed partitioning technique) algorithm.
2. Write a program to implement and simulate MFT (Memory management with variable partitioning technique) algorithm.
3. Write a program to simulate the following contiguous memory allocation techniques

a) Worst-fit b) Best-fit c)First-fit

Lab Sheet 2:

1. Write a program to simulate the LRU page replacement algorithm. The program should read the following inputs:

- Length of the reference string
- Reference string
- Number of page frames

The program should generate the following outputs:

- Page replacement sequence after each reference
- Number of page faults

2. Write a program to simulate the LFU page replacement algorithm. The program should read the following inputs:

- Length of the reference string
- Reference string
- Number of page frames

The program should generate the following outputs:

- Page replacement sequence after each reference
- Number of page faults

3. Write a program to simulate the FIFO page replacement algorithm.

Lab Sheet 3:

1. Write a set of programs to use the concept of shared memory through LINUX system calls.

- One process creates a shared memory segment and writes a message into it.
- Another process opens the segment, reads the message and outputs the message to standard output.

Some of the important system calls to be used include:
shmget(), shmat(), shmctl() etc.

Unit IV

Lab Sheet 1:

1. Write a program to simulate the Banker's Algorithm for Deadlock Avoidance. The program should read the following inputs:

- Number of Processes
- Number of resource types
- Current allocation and Maximum allocation of resources to each process
- Currently Available Resources
- New request details

The program should generate the following outputs:

- Determine whether the system is in the safe state or not

2. Modify the previous program to determine the safe sequence if the system is in safe state.

Lab Sheet 2:

1. Write a program to implement deadlock detection (resource allocation graph)algorithm.
2. Write a program to simulate deadlock prevention.

Lab Sheet 3:

1. Write a program to implement mutual exclusion of threads on LINUX using the pthread.h library Some of the important system calls to be used include: pthread_mutex_lock, pthread_self, pthread_create, pthread_exit

Subject Code: MCA21304CR
Subject Name: Machine Learning

Unit I

Linear regression, Classification Algorithms: KNN and effect of various distance measures (Euclidean, Manhattan, Mahalanobis Distances, etc.) **[4L]**
Clustering Algorithms: Fuzzy C-means, Hierarchical clustering, Density-based spatial clustering of applications with noise (DBSCAN) **[4L]**
Cluster Validity index. Compactness Cluster Measure, Distinctness Cluster Measure, Validity Index Using Standard Deviation, Point Density Based Validity Index, Validity index using Local and Global Data Spread, **[4L]**

Unit II

Logistic Regression, Support Vector Machines: Binary Linear Support Vector Machines, Optimal Hyperplane, Kernel Functions, Solving Non-linear Classification problems with Linear Classifier. Applications of Support Vector Machines. **[6L]**
Dimensionality Reduction, Principal Component Analysis, Fisher Linear Discriminant, Quadratic Discrminant Analysis, Multiple Discriminant Analysis. **[6L]**

Reference Books:
1. Introduction to Machine Learning by Ethem Alpaydin, MIT Press
2. Pattern Classification by Duda and Hart. John Wiley publication
3. The Elements of Statistical Learning: Data Mining, Inference, and Prediction by Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer
5. Machine Learning: A probabilistic Perspective, by Kevin P. Murphy, MIT Press

Discipline Centric Elective Courses

Subject Code: MCA21305DCE
Subject Name: Theory of Computation

UNIT I

Introduction to computation, Finite Automata, DFA, Kleene's theorem, Non-determinism, Finite Automata with output. Regular Languages: introduction to formal languages, regular operations, closure property Regular Expression; Equivalence of DFA, NFA, and RE. Non-Regular Languages and Pumping Lemma. **10L**

Unit II

Context-Free Languages: introduction to CFL, context free grammars, Chomsky normal form, parse trees, derivation and ambiguity, closure and non-closure properties. Pushdown Automata (PDA), Deterministic vs Non-deterministic PDAs. Non-CFL and pumping Lemma for CFLs. **10L**

UNIT III

Context-Sensitive Languages: introduction to CSL, context sensitive grammars, Linear Bounded Automata (LBA) Recursive and Recursively Enumerable Languages: introduction to REL and Chomsky hierarchy, Hilbert's algorithm and Church-Turing Thesis. Turing Machines, equivalence of Deterministic, Non-deterministic, and multi-tape TMs. Universal TMs. **10L**

Unit IV

Decidable Languages: Decidability, and Undecidability, Reductions and its applications. A Halting Problem, Complexity: Asymptotic Notation and properties thereof. Deterministic and Non-deterministic Turing Machine cost models (space and time). **10L**

References:

1. Cohen, Daniel IA, and Daniel IA Cohen. Introduction to computer theory. Vol. 2. New York: Wiley.
2. Linz, Peter. An introduction to formal languages and automata. Jones & Bartlett Learning.
3. Parkes, Alan P. Introduction to languages, machines and logic: computable languages, abstract machines and formal logic. Springer Science & Business Media, 2012.

Theory of Computation (Tutorial)

Unit I

Week 1. Kleene Closure

a. Let L= {ab, aa, baa}.Which of the following strings are in L*= { abaabaaabaa, aaaaabaaaa, baaaaaabaaaab, baaaaabaa}.

b. Let L= {ab, cd}. Write down first ten strings in L* using Lexicographic ordering

c. Show that (L*)* = L* for all languages?

Week 2. Finite Automata with output

a. What is the difference between Moore & Mealy machines?

b. Construct a Mealy machine to accept all strings ending with aa or bb over the Alphabet {a,b}.

c. How are transducers different from other automata?

Week 3. Finite Automaton and Regular Expression

a. Give a deterministic finite automaton over the alphabet {a, b} which accepts all strings containing no more than two consecutive occurrences of the same input letter. (For example, abba should be accepted but not abaaab.)$\Sigma = \{a, b, c\}$.

b. Give regular expressions for the following languages on

1. all strings containing exactly one a
2. all strings containing no more than three a's
3. all strings that contain no run of a's of length greater than two
4. all strings in which all runs of a's have lengths that are multiples of three.

Unit II

Week 4. Pushdown Automata

a. Demonstrate the Construction of a Pushdown Automata with example

b. Construct pushdown automata for the following languages. Acceptance either by empty stack or by final state. $\{ a^n b^m a^n \mid m, n \in \mathbb{N} \}$

$\{a^i b^j c^k \mid i, j, k \in \mathbb{N}, i > j\}$

$\{a^i b^j c^k \mid i, j, k \in \mathbb{N}, i + j = k\}$

$\{a^i b^j c^k \mid i, j, k \in \mathbb{N}, i + k = j\}$

Week 5. Context Free Grammar.

a. Find a Context-Free Grammar for the following language

$$L = \{a^n b^m c^k : k = n + m\}$$

b. Find a CFG that generates the language

$L(G) = \{ a^n b^m \mid 0 \le n \le m \le 2n \}$.

c. Which language generates the grammar G given by the productions

1. S → aSa | aBa B → bB | b
2. S → abScB | λ B → bB | b What language does it generate?

Week 6. Pumping Lemma

a. Demonstrate the use of Pumping Lemma for context free languages with the help of an example
b. Using Pumping Lemma, Prove $\{0^n1^n2^n \mid n \geq 0\}$ is not a context free language.

Unit III

Week 7. Turing Machines

a. Discuss Turing machine with the help of an example
b. Give a detailed description of a total Turing machine accepting the palindromes over {a, b}: that is, all strings $x \in \{a, b\}*$ such that x = rev x.

Week 8. Multi Tape Turing Machine

a. Demonstrate use of Multitape TMs with the help of an example
b. Suppose we try to construct a Turing machine to solve a particular problem, but we are not successful. Does it mean that no Turing machine exists that can solve that problem? Explain and justify your answer.

Week 9. Universal Turing Machine.

a. Demonstrate encoding of a Universal ™ with help of an example
b. Draw the state diagram for a Turing machine that increments a binary number. Assume that the input tape contains at least one non-blank symbol.

Unit IV

Week 10. Decidability

a. Discuss Decidability of a language with help of an example
b. Let L be a decidable language. Prove that the complement L' is decidable
c. Prove that L ∪ L' is decidable, when L is decidable.
d.

Week 11. Complexity Theory

a. Discuss the concept of Complexity theory in terms of DTIME, DSPACE,NTIME, NSPACE
b. Compute computation complexity of language L= {0^n1^n| n>0}

Week 12. The Halting Problem

a. Explain the concept of Reduction.
b. Is there an explicit program P so that for a given y it is decidable whether P terminates on input y?

Course No.: MCA21306DCE
Course Title: Wireless and Mobile Communication

Unit I
Classification and types of Wireless telephones. Introduction to Cordless, Fixed Wireless (WLL), Wireless with limited mobility(WLL-M) and (Fully)Mobile Wireless phones. Introduction to various generations of mobile phone technologies and future trends. Wireline vs. Wireless portion of mobile communication networks. Mobile-Originated vs. Mobile-Terminated calls. Mobile Phone numbers vs. Fixed-Phone numbers. **[10L]**

Unit II
Concept of cells, sectorization, coverage area, frequency reuse, cellular networks & handoffs. Wireless Transmission concepts; types of antennas; concepts of signal propagation, blocking, reflection, scattering & multipath propagation. Comparison of multiple access techniques FDM, TDM and CDM. Concept of Spread Spectrum(SS) techniques; Frequency Hopping SS . Direct Sequence SS and concept of chip-sequence. **[10L]**

Unit III
Concept of Forward and Reverse CDMA channel for a cell/sector. Concept/derivation of Walsh codes & Code Channels within a CDMA Channel. Simplified illustration of IS-95 CDMA using chip sequences. Purpose of Pilot, Sync, Paging, Forward Traffic Channels. Purpose of Access & Reverse TCs. **[10L]**

Unit IV
GSM reference architecture and components of Mobile Networks: MS, BTS, BSC, MSC; their basic functions and characteristics. Use of HLR and VLR in mobile networks. Handoff scenarios in GSM. **[10L]**

References Books:
T. Rappaport, "Wireless Communications, Principles and Practice(2nd Edition)",Pearson.Andy Dornan, "The Essential Guide to Wireless Communications Applications",Pearson. Jochen Schiller, "Mobile Communications", Pearson. K.Pahlavan, P.Krishnamurthy, "Principles of Wireless Networks", PHI.

Course No.: MCA21306DCE
Course Title: Wireless and Mobile Communication Tutorials

Unit I

Tutorial 1

Q1. Describe the evolution of wireless and mobile communication technologies by writing concise notes on:
(a) Fixed Wireless (b) Cordless Phones (c) WLL / WLL-M technologies (d) Fully-Mobile Wireless

Q2. Name and briefly describe three technologies used by second-generation mobile networks and indicate the bandwidth of the channel used by each one.

Q3. Explain the concept of a cell, coverage area and sectorization.

Tutorial 2

Q1 Draw a diagram showing the positioning of wireless networks vis – a - vis wired network.

Q2 Why are wired network usually part of the wireless infrastructure?

Q3 Differentiate between Portability, nomadicity and mobility

Tutorial 3

Q1 Name three channel sounding techniques, Give the advantages and disadvantages of each.

Q2 What are the three important radio propagation phenomena at high frequencies? Which of them is predominant indoors

Unit II

Tutorial 1

Q1. Using diagrams, explain the idea of Frequency Reuse in the context of AMPS and CDMA.

Q2. Using a diagram and text explain the concept of handoff/handover in mobile networks.

Q3. Write short notes on: (a) types of antennas; (b)concepts of signal propagation, blocking, reflection, scattering & multipath propagation.

Tutorial 2

Q1 Name the two most popular techniques used in digital cellular modems and give one example standard that uses each of them.

Q2 For a 64-QAM modem give the SNR at which the error rate over a telephone line is 10.

Q3 Why is PPM used with infrared communication instead of PAM?

Tutorial 3

Q1 Name a cellular telephony standard that employs FDMA

Q2 What are the popular access schemes for data networks? Classify them.

Q3 Name two duplexing methods and one example standard that uses each of these technologies.

Unit III

Tutorial 1

Q1. Using diagrams and text explain the Concepts of Spread Spectrum(SS) techniques; Frequency Hopping SS & Direct Sequence SS.

Q2. Explain using diagrams the Concept of Forward and Reverse CDMA channel for a cell/sector.

Q3. Explain the Concept/Derivation of Walsh codes & Code Channels within a CDMA Channel.

Tutorial 2

Q1 What is the difficulty of implementing CSMA/CD in a wireless environment

Q2 What is the capture effect and how does it impact the performance of the random access methods?

Q3 Name three standard using TDMA/TDD as their access method.

Tutorial 3

Q1 Assume that you have a six secyor cells in a hexagonal geometry. Draw the hexagonal grid corresponding to this case, Compute S, for reuse factors of 7,4 and 3. Comment on your results

Q2 Compare peer to peer and multihop ad hoc topologies

Unit IV

Tutorial 1

Q1. Explain the Purpose of Pilot, Sync, Paging, Forward Traffic Channels in CDMA networks.

Q2. Using diagrams and text explain briefly GSM reference architecture and components of Mobile Networks: MS, BSC, NSS; their subsystem functions and characteristics.

Q3. Draw diagrams with associated text to explain various Handoff Scenarios supported in GSM.

Tutorial 2

Q1 Give three reasone why it is difficult to dwtect collusions at the transmitter in wireless networks.

Q2 What are the new elements added to the GSM infrastructure to support GPRS?

Q3 What are the new elements added to the AMPS infrastructure to support CDPD?

Tutorial 3

Q1 Draw the protocol stack of CDPD to the M-ES at the MDMS and at thr ND-IS. Show the communication between different peer layers.

Q2 Of the design goals of CDPD which three do you consider important? Why?

Q3 Explain with diagram MTP, PTP ?

Subject Code: MCA21307DCE
Subject Name: Organisational Behaviour

Unit I
Definition, need and importance of organizational behaviour, Nature and scope, Frame work, Organizational behaviour models.[6 L]
Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification.[6L]

Unit II
Misbehaviour – Types – Management Intervention.[2L]
Emotions - Emotional Labour – Emotional Intelligence – Theories.[2L
Attitudes – Characteristics – Components – Formation – Measurement- Values.[2L]
Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management.[3L]
Motivation – importance – Types – Effects on work behaviour[3L]

Unit III
Organization structure – Formation – Groups in organizations [2L]
Influence – Group dynamics – Emergence of informal leaders and working norms [3L] Group decision making techniques – Team building - Interpersonal relations [3 L] Communication – Control. [2L]
Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics. [2L]

Unit IV
Oganizational culture and climate, Factors affecting organizational climate[2L] Job satisfaction – Determinants – Measurements – Influence on behaviour. Organizational change – Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. [4L]
Stress, Work Stressors, Prevention and Management of stress, Balancing work and Life. [3L]
Organizational development, Characteristics, objectives, Organizational effectiveness [3L]

TEXT BOOKS

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition.

Reference Books:
1. Schermerhorn, Hunt and Osborn, Organisational behaviour, John Wiley
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education.
3. Mc Shane & Von Glinov, Organisational Behaviour, 4th Edition, Tata Mc Graw Hill.
4. Hellrigal, Slocum and Woodman, Organisational Behavior, Cengage Learning, 11th Edition.
5. Ivancevich, Konopaske & Maheson, Organisational Behaviour & Management, 7th edition, Tata McGraw Hill.

Tutorials questions
Organisational Behaviour

Unit 1
Tutorial 1
Q1 Define Organisational Behaviour. State its importance and scope.
Q2 Define planning. Explain the steps involved in planning and state the limitations in planning
Q3 Explain the importance of planning as the beginning of the process of management. State how decision making plays a vital role in the exercise of planning.

Tutorial 2
Q1 Distinguish clearly between intrapersonal and interpersonal conflicts. Quote an example. How does it deteriorate teamwork in the organisation?
Q2 State how systems Approach and contingency Approach have played the role of integrating various fragmented approaches of management
Q3 Explain the theory of transactional analysis. Discuss ego states as its link

Tutorial 3
Q1 Which leadership style is suitable to HR Manager of I.T. industry in the present era. Give justification
Q2 Discuss the merits and demerits of formal and informal group formation in industrial organisation functioning at the national level
Q3 Elaborate on the evolution of management thought & its relevance in today's scenario

UNIT 2
Tutorial 1
Q1 Define motivation. Elaborate A.H.Maslow' s hierarchy theory of motivation.
Q2 "Controlling techniques are very effective in an organisation". Elaborate
Q3 Write short notes on
Formation of the team.
b) Principles of decision making.
c) Dimensions of attitude.
d) MBO.
e) Stress management.

Tutorial 2
Q1 Elaborate on the SOBC model of O.B. Give Examples
Q2 Explain the concept of conflict management with its Process.
Q3 Compare A.H. Maslow's theory with Herzberg's theory of Motivation

Tutorial 3
Q1 Explain the meaning of personality. What are the determinants of personality? Give relevant examples.
Q2 Distinguish between formal organizations & informal organizations. Explain the importance of the formation of teams
Q3 Write short notes on
a) Functions of management.
b) Morale Indicators.
c) Dimensions of attitude.
d) Planning premises.

e) Job satisfaction.

UNIT 3

Tutorial 1

Q1 "Nothing is constant, the only change is constant". Explain the statement w.r.t. factor responsible for the change.

Q2 What is departmentalization? Explain the various types of departmentalization?

Q3 Write short notes on

1) Decision-making process.
2) Leadership styles.
3) Models of OB.
4) Functions of Management.
5) Line and staff authority.

Tutorial 2

Q1 What are the different types of motives? Explain A.H.Maslow's hierarchy need a theory of motivation

Q2 "Its is remarked that attitudes shape the personality of an individual". Comment.

Q3 Explain nature 7 purposes of planning with its steps, in detail.

Tutorial 3

Q1 what do you understand by 'Motives' and explain the Herzberg theory of motivation, with Relevant examples.

Q2 Define stress. Explain ill effects of stress on human beings. How do people manage stress

Q3 Enumerate various factors responsible for the change

UNIT 4

Tutorial 1

Q1 What is conflict? . What are the sources of conflict?

Q2 What can be the consequences of conflict on an organisation?

Q3 .How can grievance affect an organisation and its employees? Describe the process of handling grievance

Tutorial 2

Q1 What are the Factors affecting organizational climate

Q2 How can an employee balance his work and personal life in an organisation

Q3 What do you mean by Organisational Culture? State its elements. Also discuss how organisational culture can be created and sustained.

Tutorial 3

Q1 Explain in details the various types of culture?

Q2 How to create a positive organsational culture?

Q3 Write short notes on:

Strong Vs. Weak Culture

II. Soft Vs. Hard Culture

III. Formal Vs Informal Culture

IV. Concept of Workplace Spirituality

MCA21301OE
Fundamentals of Programming with C

Unit I

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

Unit II

Conditional Control Statements: Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, DoWhile and Examples. Functions: Function Basics, User-defined Functions, Arrays, One and Two- Dimensional Arrays.

References:

1. B.A. Forouzan and R.F. Gilberg, "A Structured Programming Approach in C", Cengage Learning
2. Byron Gottfried, "Programming With C", Schaum Series, Prentice Hall of India
3. Rajaraman V, "The Fundamentals of Computer", 4 th Edition, Prentice-Hall of India.

Semester – IV

Project Work

MCA21401OE
Management Information System

Unit I

MIS Basics, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS. Planning, Implementation and Controlling of Management Information System.

Unit II

Fundamentals of Data Processing, Computer Operation of Manual Information System, Components of Computer Systems, Flow Chart, Conversion of Manual to Computer Based Systems, Computer Systems Software, Application Software. Managerial Decision Making, characteristics and components of Decision Support System.