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-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 – 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 ∈ {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.