

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Programming with Python
<b>Course Code</b>	MCA 106-B(P)

Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					0	0	3	3
<b>Course Type</b>	Lab only							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>				<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember the basic programming concept.(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> Understand the basics of Python like python origin downloading and installing and basic concepts of python.(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> Apply the various conditional and looping statement and functional programming.(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> Explain various objects numbers and sequence in python Analyze the concept of regular expression(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> Evaluate the concept of object-oriented programming for better utilization of language(<b>BL5-Evaluate</b>)</p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)				

## Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Python programming Introduction, origin of Python, Downloading, Installing and Running Python, Python Basics: Comment, Identifier, Indentations, Basic data types, conversions, operators, Build in functions. I/O Statements, Condition Statements & Loops: If, else, elif), conditional expressions, while, for, break continue	Lectures	6
Unit 2	Data Structures in Python, Regular Expressions Lists: Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations, Working with list, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Set: Introduction ,Accessing set, Operations, Working with sets Regular Expressions: Introduction/motivation, special symbols and characters for REs , Match function, Search function., Matching VS Searching., Modifiers, Patterns.	Lectures	12
Unit 3	Functions, Modules, File Handling Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous function, Global and local variables, Recursion. Modules: Creating modules, Importing module, Packages, File Handling: Opening and closing files, Reading and writing files	Lectures	10
Unit 4	Exceptional Handling, Object Oriented Programming in Python Exception Handling: Exception, Exception Handling, Try and Except clause, User Defined Exceptions, Exception handling in files). Object Oriented Programming in Python Introduction, OOPS Basics: Class and object Constructors, Need of Encapsulations, Attributes, default attributes, static attributes, static methods, initializing objects, Pass by reference, self. Relational-ships: Introduction, Aggregation, Dependency. Inheritance: Need of Inheritance, Overriding, Super, Types of Inheritance. Abstract Class, methods.	Experiments	15
Unit -5	(Web Programming) Introduction, Creating Simple Web Client, Advanced Web Clients, CGI, Building CGI Applications.	PBL	20

## Part C

S.NO.	Practical List																		
1	Program to count the number of each vowel in a string.																		
2	Program to Find Sum of Natural Numbers Using Recursion.																		
3	Program To Display Powers of 2 Using Anonymous Function.																		
4	Program to Accept Three Digits and Print all Possible Combinations from the Digits.																		
5	Program to Find the Sum of the Series: $1 + x^2/2 + x^3/3 + \dots + x^n/n$ .																		
6	Program to Create a List of Tuples with the First Element as the Number and Second Ele as the Square of the Number.																		
7	Program to Count the Frequency of Words Appearing in a String Using a Dictionary.																		
8	Program to Remove the Duplicate Items from a List.																		
9	Program that Displays which Letters are in the First String but not in the Second																		
10	<p>ARS Gems Store sells different varieties of gems to its customers. Write a Python progra calculate the bill amount to be paid by a customer based on the list of gems and quantity purchased. Any purchase with a total bill amount above Rs.30000 is entitled for 5% disco If any gem required by the customer is not available in the store, then consider total bill amount to be -1. Assume that quantity required by the customer for any gem will always b greater than 0. Perform case-sensitive comparison wherever applicable.</p> <p>Hours</p>																		
11	<p>Given a list of integer values. Write a python program to check whether it contains same number in adjacent position. Display the count of such adjacent occurrences.</p> <p>1.0 Hours</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 20%; text-align: center;">Sample Input</th> <th style="width: 20%; text-align: center;">Expected Output</th> <th style="width: 30%;"></th> </tr> </thead> <tbody> <tr> <td></td> <td style="text-align: center;">[1,1,5,100,-20,-20,6,0,0]</td> <td style="text-align: center;">3</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">[10,20,30,40,30,20]</td> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td></td> <td style="text-align: center;">[1,2,2,3,4,4,4,10]</td> <td style="text-align: center;">3</td> <td></td> </tr> </tbody> </table>				Sample Input	Expected Output			[1,1,5,100,-20,-20,6,0,0]	3			[10,20,30,40,30,20]	0			[1,2,2,3,4,4,4,10]	3	
	Sample Input	Expected Output																	
	[1,1,5,100,-20,-20,6,0,0]	3																	
	[10,20,30,40,30,20]	0																	
	[1,2,2,3,4,4,4,10]	3																	
12	Program to Count the Occurrences of a Word in a Text File.																		
13	Program to Read a File and Capitalize the First Letter of Every Word in the File.																		
14	Program to Create a Class which Performs Basic Calculator Operations																		



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Android based Application Development
<b>Course Code</b>	MCA 106-B(P)

### Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					0	0	3	3
<b>Course Type</b>	Lab only							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Having the exposure about the object-oriented programming.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember various syntax rules of the programming language such as java and XML(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand Object Oriented concepts for Android and various mobile application development concepts including interface designing, handling multiple activities(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement XML, Java and mysql for database connectivity and file system(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To analyze various widgets and learn to use them as per the problem(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To develop solutions for real world problems using android application development(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG4(Quality education) SDG8(Decent work and economic growth)				

## Part B

Modules	Contents	Pedagogy	Hours
1	Getting Started with Android - Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file	whiteboard/PPT, Recorded video/interactive videos	08
2	Android Application Design Essentials - Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions. Activity States and Life Cycle. XML : Tage, Namespaces.	whiteboard/PPT, Recorded video/interactive videos	10
3	Building Blocks of Mobile Apps - Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	whiteboard/PPT, Recorded video/interactive videos	9
4	Shared Preferences, Mobile Databases such as SQLite, Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	whiteboard/PPT, Recorded video/interactive videos	08
5	Using Common Android APIs: Using Android Data and Storage APIs, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.	whiteboard/PPT, Recorded video/interactive videos	08

## Part C

### Project Based Learning on Android Based Application Development

1. Develop an application that uses components, Font and Colors.
2. Develop a native calculator application.
3. Develop an application that uses layout managers and events managers.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that creates an alert upon receiving a message
6. Develop an application that makes use of database.
7. Implement an application that implements multi-threading.
8. Develop a native application that uses GPS location information
9. Create a mobile application that creates alarm clock.
10. Create an application that makes use of Explicit and implicit intents.

## Part D(Marks Distribution)

### Theory

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
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### Practical

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
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100	40	60	30	40	20
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## Part E

### Books

Lauren Darcey and Shane Conder, Android Wireless Application Development, Pearson Education, 2nd ed. (2011)

### Articles

B.M.Harwani Android Programming Unleashed Pearson Education Inc 2013

### References Books

Charlie Collins, Michael D.Galpin, Matthias Kappler, Android in Practice, DreamTech Press 2016

### MOOC Courses

### Videos





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Computer Oriented Mathematics
<b>Course Code</b>	MCA-101[T]

### Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	0	2
<b>Course Type</b>	Theory only							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	computer-oriented mathematics include a strong foundation in algebra, calculus, and discrete mathematics. Proficiency in programming languages like Python and understanding of data structures and algorithms are crucial. Additionally, familiarity with numerical methods, linear algebra, and probability theory is beneficial			<b>Co-Requisite/s</b>	computer-oriented mathematics typically include courses in computer science fundamentals such as data structures, algorithms, and programming languages. Additionally, concurrent study of mathematical topics like linear algebra, calculus, and discrete mathematics is essential for understanding and applying mathematical concepts in computational contexts.			
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Understand Relation and Function on the sets. <b>(BL1-Remember)</b> <b>CO2-</b> Familiarize direct products, finitely generated Abelian groups, factor groups. <b>(BL2-Understand)</b> <b>CO3-</b> Understand group action on sets isotropy subgroups. <b>(BL3-Apply)</b> <b>CO4-</b> To learn to find Eigen values and Eigen vectors of a matrix which is used in the study of vibrations, chemical reactions and geometry. <b>(BL4-Analyze)</b> <b>CO5-</b> Understand the basic ideas of vector algebra: linear dependence and independence and spanning <b>(BL5-Evaluate)</b> <b>CO6-</b> To learn the importance of linear transformation in Physics, Engineering, Social sciences and various branches of Mathematics. <b>(BL6-Create)</b>							
<b>Courses Elements</b>	Skill Development ✗ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Relation and Function: Definition, Equivalence Relation, Partial Order Relation, Functions: Definition, Principle of Inclusion and Exclusion, A Relational Model for Data Bases, Properties of Binary Relations, Closure of Relations. Posets, Hasse Diagram and Lattices: Introduction, Ordered Set, Hasse Diagram of Partially Ordered Set, Isomorphic Ordered Set, Well Ordered Set.	Audio/Video clips, group discussion, lecture with ppt, quiz	10
2	Boolean Algebra, Principle of Duality, Boolean Function, Normal Form and application in Switching Circuits. Algebraic Structures: Binary Operation, Definition, Properties, Semigroup, Monoid, Group, Abelian Group, Properties of Group, Subgroup, Cyclic Group, Cosets, Factor Group, Permutation Groups, Normal Subgroup.	Audio/Video clips, group discussion, lecture with ppt, Review Analysis	9
3	Graph Theory: Introduction and Basic Terminology of Graphs, Planer Graphs, Multigraphs and weighted graphs, Isomorphic Graphs, Walk, Paths, Cycles and Connected Graph, Complete Graph, Shortest Path in Weighted Graph, Matrix Representation of Graph, Eulerian Paths and Circuits, Tree, Spanning Tree, minimal Spanning Tree.	Audio/Video clips, group discussion, lecture with ppt, classroom presentations, Analysis	10
4	Rank, Solution of simultaneous equation by elementary transformation, consistency of equations, eigen value and eigen vectors, Cayley Hamilton theorem, Inverse matrix, diagonalization.	Audio/Video clips, group discussion, lecture with ppt, quiz	9
5	Orthogonality, inner product, length, orthogonal set, orthogonal projection, the Gram-Schmidt process, least square problem, solve least square with inverse. Vector space, subspace, null space, column space, linear transformation, bases, rank, dimension of vector space, change of basis.	Audio/Video clips, group discussion, lecture with ppt, quiz	9



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Object Oriented Programming With Java
<b>Course Code</b>	MCA-102[T]

### Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	1	3
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	basic knowledge of any one programming language such as C/C++			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember various syntax rules of java programming(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand various Object-Oriented Concepts, Exception handling, Multithreading, networking and database connectivity techniques(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement java AWT and Swing and for GUI Programming and Event handling, java IO for Input and output handling, jdbc for database connectivity(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To analyze various Error ,and Database Handling techniques to learn how to improve the performance of the java application.(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate and compare various application Development techniques(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

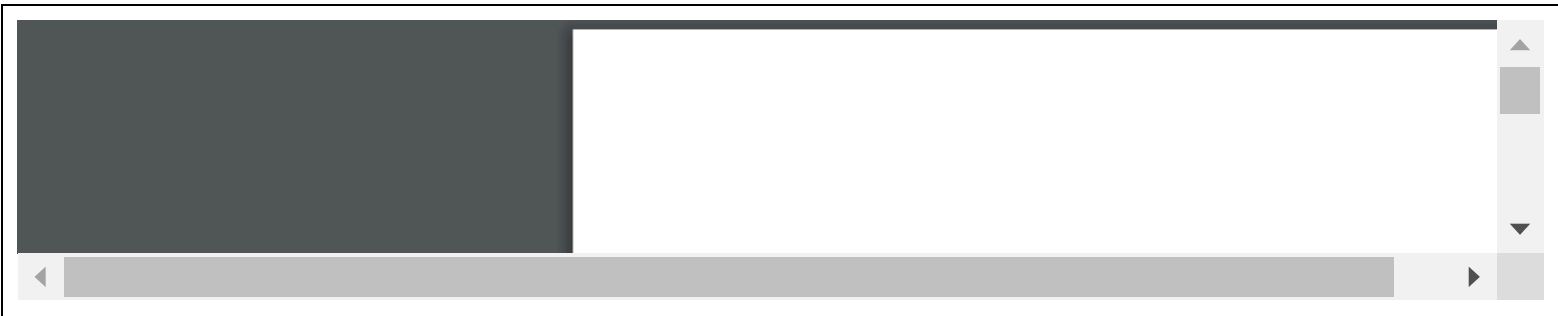
## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introduction to JAVA History of Java: Comparison of Java and C++; Java as an object oriented language: Java buzzwords; Java virtual machine and JRE;<b>Java Development Tools:</b> Eclipse, NetBeans, IntelliJ IDEA, Maven, Gradle,A simple program, its compilation and execution; the concept of path and CLASSPATH; Basic idea of application Java Basics: Data types; Operators- precedence and associativity; Type conversion; The decision making – if, if ..else, switch; loops – for, while, do...while; advanced for loop. Special statements– return, break, continue, labeled continue; Modular programming methods and method overloading; array sand String, mutable and immutable String Buffer and String Builder ; memory allocation and garbage collection ,static and final keyword, wrapper classes, unboxing and autoboxing</p> <p>Object Oriented Programming in Java: Class fundamentals, command line arguments,Packages; scope and lifetime; Access specifies,utility ,packages, imports a package.</p> <p>Constructors; Copy constructor; this pointer; finalize () method; arrays; Memory allocation and garbage collection..</p> <p>Inheritance : Inheritance basics, method overriding, polymorphism, static and dynamic polymorphism.</p>	Lecturing	15
2	<p>Abstract Class &amp; Interfaces : abstract classes, uses of abstract classes, implementation of abstract class, defining an interface, implementing &amp; applying interfaces, variables in interfaces,extending interfaces,Diffrences between abstract classes and Interfaces</p> <p>Exception Handling and Multithreading : Basic idea of a Thread, differences between process and Thread, multithreaded programming; different states of a Active thread, The lifecycle of a thread; Creating thread with the thread class and runnable interface, thread constructor and thread methods; Thread synchronization; Thread scheduling; Producer consumer relationship; Daemon thread, Selfish threads, interThreaded communication .Exception handling;The class hierarchy for Throwable ,call stack mechanism checked and unchecked Exception. Try, catch and finally block , throw and throws clause .</p> <p><b>Java Frameworks:</b> Overview of Java frameworks such as Spring, Hibernate, and</p>	Lecturing	10

Struts

3	<p>Applets: basic idea of Applet, Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTML Tags for applet.AWT &amp; Swing: The class hierarchy of window fundamentals; The basic user interface components Label, Button, Check Box, Radio Button, Choice menu, Text area, Scroll list, Scroll bar; Frame; Layout managers- flow layout, Grid layout, Border layout, Card layout.JAVA Foundation Classes The Java Event Handling Model: Java's event delegation model – ignoring the event, Self contained events, Delegating events; The event class hierarchy; The relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Key Event, Mouse Event,Text Event, Window Event.</p>	Experiment	9
4	<p>Input/Output : Exploring Java i.o., Directories, stream classes, The Byte stream : Input stream, output stream, file input stream, file output stream, print stream, Random access file, the character streams, Buffered reader, buffered writer, print writer, serialization.JAVA Database Connectivity(JDBC);JDBC Drivers, Connection Interface,ResultSet types of ResultSet,applying insert ,delete,display and updat operation</p>	PBL	7
5	<p>Networking &amp; RMI: Java Networking: Networking Basics : Socket, Client server, reserved sockets, proxy servers, Inet address, TCP sockets, UDP sockets. RMI for distributed computing;RMI registry services; Steps of creating RMI Application and an example.</p>	PBL	4

Part C





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Artificial Intelligence
<b>Course Code</b>	MCA-103[T]

### Part A

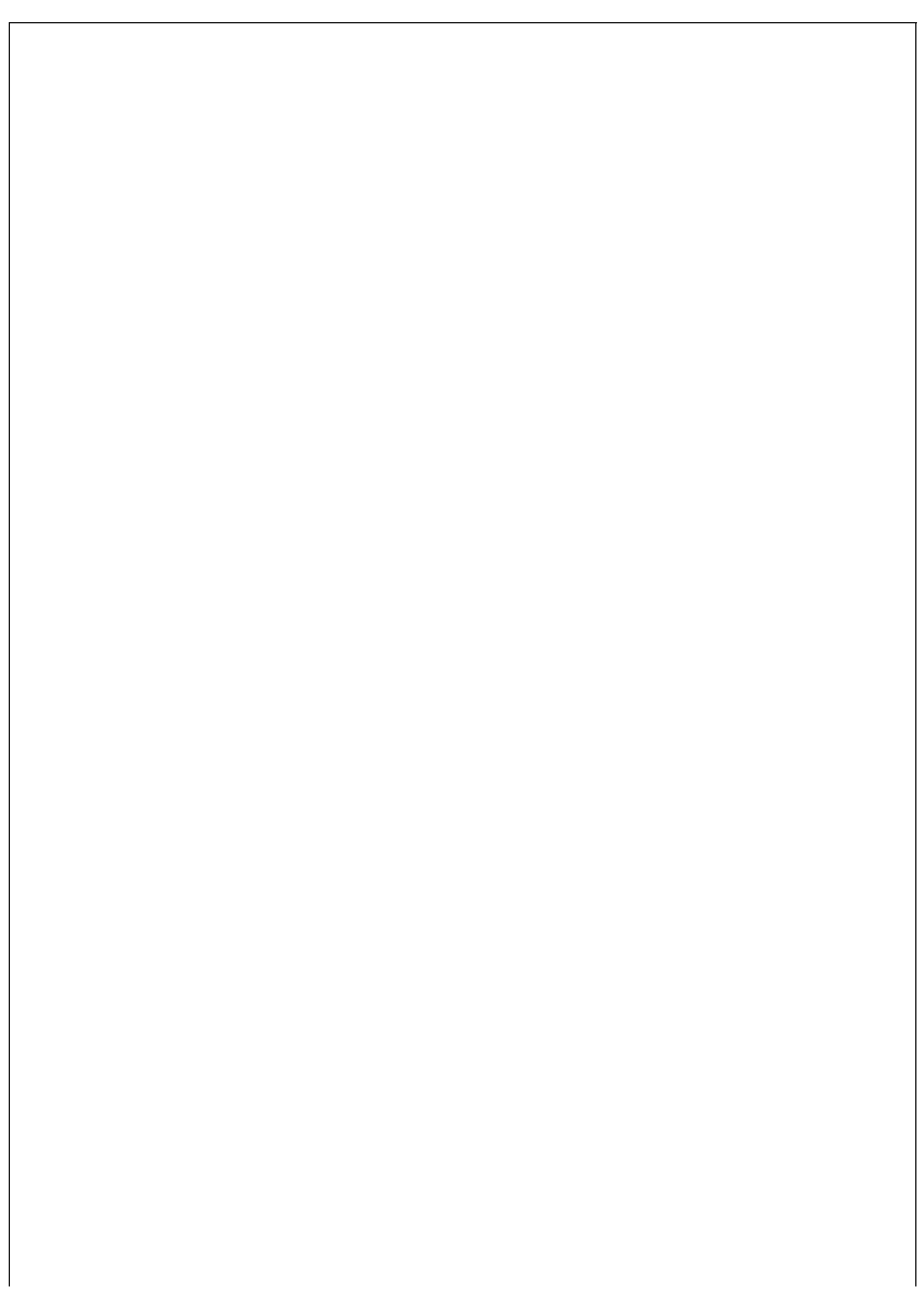
Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	1	3
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	A basic understanding of computer science fundamentals is beneficial. This includes knowledge of algorithms, data structures, and computer programming. Proficiency in a programming language, such as Python or Java, is often assumed.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Remember: To remember various concept of Artificial Intelligence. <b>(BL1-Remember)</b></p> <p><b>CO2-</b> Introduce: To introduce the basics concept of automation with the concept of Artificial Language. <b>(BL2-Understand)</b></p> <p><b>CO3-</b> Implement: To Implementation, apply various Reinforcement Learning Model, FOPC, NLP Deep Learning techniques, Robotic Model, Problem Solving Techniques, Searching Techniques, Types of agents. <b>(BL3-Apply)</b></p> <p><b>CO4-</b> Analyze: To analyze the performance of various Tools of Artificial Intelligence <b>(BL4-Analyze)</b></p> <p><b>CO5-</b> Evaluate: To evaluate the performance of Efficient AI enabled model; <b>(BL5-Evaluate)</b></p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				



## Part B

Modules	Contents	Pedagogy	Hours
Unit -1	General Issues and Overview of AI: The AI problems, what is an AI technique, Characteristics of AI applications. Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables, iteration and recursion, property lists and arrays.	Lecturing	6
Unit -2	Problem Solving, Search and Control Strategies General problem solving, production systems, control strategies forward and backward chaining, exhaustive searches depth first breadth first search. Heuristic Search Techniques Hill climbing, branch and bound technique, best first search & A* algorithm, AND / OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems.	Experiments	9
Unit -3	Knowledge Representations: First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency	Lecturing	10
Unit - 4	Natural Language processing Parsing techniques, context free grammar, recursive transitions nets (RNT), augmented transition nets (ATN), case and logic grammars, symantic analysis. Game playing Minimax search procedure, alpha-beta cutoffs, additional refinements. Planning: Overview an example domain the block world, component of planning systems, goal stack planning, non linear planning.	Experiments	10
Unit -5	Probabilistic Reasoning and Uncertainty: Probability theory, bayes theorem and bayesian networks, certainty factor. Expert Systems: Introduction to expert system and application of expert systems, various expert system shells, vidwanframe work, knowledge acquisition, case studies, MYCIN. Learning: Rote learning, learning by induction, explanation based learning.	Case Study	10

## Part C



## Case Study

### Rules/Instructions

- Students are required to prepare Case study on any one of the topic.
- Typed (Properly formatted , at least 20 Pages with front page and index , summary )
- Students are required to upload the signed copy of case study on LMS within time line.
- It is an individual activity

### Topic : I. Predicting Stock Market Trends using Machine Learning Algorithms

It must consist of following points-

- Overview of Machine Learning and algorithms.
- Emphasis should be given on literature review with respect to role of machine learning in predicting stock market trends.
- Supporting data survey by the reputed organization/Journals can be added to case study.
- References

### Topic : II

#### Integrating Expert Systems in Healthcare: A Case Study of Improved Diagnosis and Treatment

It must consist of following points -

- Key features of expert system.
- Architecture used in expert system
- Examples of expert system.
- Comparative study of expert systems used in healthcare Industry using literature survey.
- Results in graphs illustrating effectiveness of expert system in Diagnosis and Treatment
- References



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Computer Networks
<b>Course Code</b>	MCA-104[T]

### Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	1	3
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Disciplinary Major							
<b>Pre-Requisite/s</b>	Prerequisites: Student must be familiar with the basic knowledge of computer fundamentals, hardware, algorithms and basic concepts of network			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Remembering the concepts of computer networks, their types.( <b>BL1-Remember</b> ) <b>CO2-</b> Understand to the concept of Classfull and Classless addressing Network address Translation, Mobile IP.( <b>BL2-Understand</b> ) <b>CO3-</b> Apply to Unicast and Multicast Routing and Next Generation IP for networking.( <b>BL3-Apply</b> ) <b>CO4-</b> Analyze the applications to address the issues of Networking Technologies.( <b>BL4-Analyze</b> ) <b>CO5-</b> Evaluating to investigate routers, IP and Routing Algorithms in Network Layer( <b>BL5-Evaluate</b> )							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗			<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)			

## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introduction: Computer Network , Layered Network Architecture-Review of ISO-OSI Model.,Transmission Fundamentals: Communication Media-Conductive Metal (Wired Cable), Optical Fiber links, Wireless Communication-Radio links, Satellite Links. Network Topologies : Star,Bus, Ring, Transmission modes : Simplex, half duplex, full duplex.</p> <p>Communication Services &amp; Devices: Types of service –connection oriented, connectionless,Telephone System., Integrated Service Digital Network (ISDN), Cellular Phone, ATM Modulation &amp;Demodulation: Digital to Analog Conversion-Frequency Modulation (FM),Amplitude, Modulation (AM), Phase Modulation (PM)., Analog to Digital Conversion-Pulse Amplitude Modulation(PAM), Pulse Code Modulation (PCM), Differential Pulse Code Modulation, (DPCM)., Multiplexing : Frequency Division Multiplexing (FDM)., Time Division Multiplexing (TDM), Statistical Time Division Multiplexing (STDM)</p> <p>MAC Sub Layer: Contention Protocols, Stop-Go-Access Protocol, Aloha Protocols-Pure &amp; Slotted , Carrier sense multiple access with collision detection (CSMA/CD)</p>	Lecturing	12
2	<p>Data Link Layer : Functions of data link layer, Data Security and Integrity: Parity Checking Code, Cyclic redundancy checks (CRC), Hemming Code Flow control Protocols: Basic flow control, Sliding window protocol-Go-Back-N protocol and selective repeat protocol, Protocol correctness- Finite state machine.</p>	Lecturing	10
3	<p>Local Area Network: Ethernet : 802.3 IEEE standard, Token Ring : 802.5 IEEE standard,Token Bus : 802.4 IEEE standard, FDDI Protocol, DQDB Protocol, Inter Networking, Layer 1 connections- Repeater, Hubs, Layer 2 connections- Bridges, Switches, Layer 3 connections-Routers, Gateways.</p>	Lecturing	9
4	<p>Wide Area Network: Introduction, Network Layer Functioning: Routing, Routing Tables,Types of routing, Dijkstra's Algorithm,</p>	Lecturing BPL	8

Bellman-Ford Algorithm, Link state routing, Open shortest path first, Flooding, Broadcasting, Multicasting, Congestion & Dead Lock. Internet Protocols: IPV IV, IPV VI Transport Layer : Functions of Transport layer, handshaking,connection life cycle, Overview of TCP/IP, Transport protocols, Elements of Transport Protocol,Transmission control protocol (TCP), User data-gram protocol (UDP).

**Network Performance:** Throughput, latency, and packet loss

Application Layer : Overview of DNS, SNMP, email, FTP, HTTP, WWW, Virtual Terminal Protocol, Multimedia.Network Security: Network Threats and its solution, Basics of cryptography, Cryptography.

Lecturing

5

6



## Part C

### List of Experiments

<i>S NO.</i>	<b>Index</b>
1	Performing an initial switch configuration.
2	Performing an initial how to connect two different networks using router configuration.
3	Simulate to Mesh Topology based network using CISCO Packet Tracer.
4	To Study of Internet connection in Local Area Network, Set the different IP addresses and subnet mask of the generic system cisco packet tracer.
5	Simulate the Network Topology and understand how can used to IP Address during the designing time.
6	Simulate to Star Topology based network using CISCO Packet Tracer.
7	Simulate to Ring Topology based network using CISCO Packet Tracer.
8	Simulate to BUS Topology based network using CISCO Packet Tracer.



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Structures and applications
<b>Course Code</b>	MCA-105[T]

### Part A

Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	1	3
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	To understand the contents and successfully complete this course, a participant must have a basic understanding of Storage Systems, Operating systems, Networking and Database.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> Understanding: comprehensive knowledge of the data structures; <b>(BL2-Understand)</b> <b>CO2-</b> Applying: understand the importance of data and be able to identify the data requirements for an application; <b>(BL3-Apply)</b> <b>CO3-</b> Analyzing: have a practical experience of algorithmic design and implementation; <b>(BL4-Analyze)</b> <b>CO4-</b> Evaluating: practical experience of developing applications that utilize data structures and evaluating the performances of applications; <b>(BL5-Evaluate)</b> <b>CO5-</b> Creating: develop projects requiring the implementation of various data structures <b>(BL6-Create)</b>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

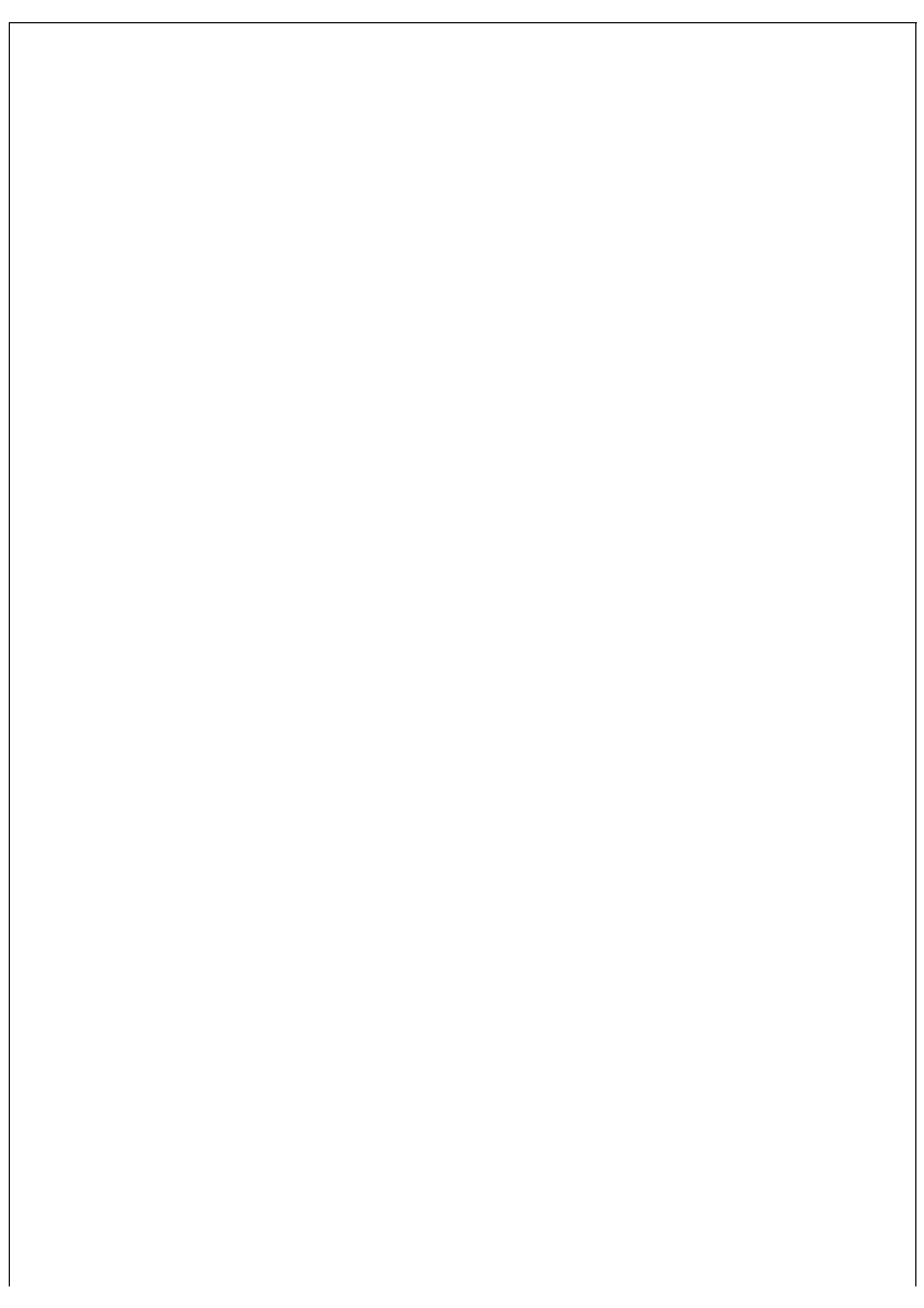
Part B

Modules	Contents	Pedagogy	Hours
1	<p>Overview of Data Structure: Definition, types, various operations and applications.</p> <p>Stack and Queue: contiguous implementations of stack, various operations on stack, various polish notations-infix, prefix, postfix, conversion from one to another order using stack; evaluation of post and prefix expressions. Contiguous implementation of queue: Linear queue, its drawback; circular queue; various operations on queue</p> <p>Advanced Stack Applications: Recursion implementation, balancing symbols, parsing expressions.</p> <p>Sparse Matrix: Representation and operations using arrays and linked lists</p>	Lectures with whiteboard/PPT, Recorded video/interactive videos, case study	7
2	<p>General List: list and it's contiguous implementation, it's drawback; singly linked list- operations on it; doubly linked list- operations on it; circular linked list; linked list using arrays.</p>	Lectures with whiteboard/PPT, Recorded video/interactive videos, case study	7
3	<p>Graph: related definitions: graph representations- adjacency matrix, adjacency lists, adjacency multi list; traversal schemes- depth first search, breadth first search; Minimum spanning tree; shortest path algorithm; kruskals &amp; dijkstras algorithm.</p> <p>Network Flow Problems: Max-flow min-cut theorem</p>	Lectures with whiteboard/PPT, Recorded video/interactive videos, practical problems	7
4	<p>Trees: definitions-height, depth, order, degree, parent and child relationship etc; Binary Trees- complete binary tree, almost complete binary tree; Tree traversals- preorder, in order and post order traversals, their recursive and non recursive implementations; expression tree- evaluation; Threaded binary trees; forests, conversion of forest into tree.</p> <p>Binary search tree: Binary Tree Representation, Basic Operations, Defining a Node</p>	Lectures with whiteboard/PPT, Recorded video/interactive videos	7
5	<p>Searching, Hashing and Sorting: requirements of a search algorithm;</p>	Lectures with whiteboard/PPT, Recorded video/interactive videos, Practical Labs	7

sequential search, binary search, indexed sequential search, interpolation search; hashing- basics, methods, collision, resolution of collision, chaining; Internal sorting- Bubble sort, selection sort, insertion sort, quick sort, merge sort, shell sort, heap sort, tree sort.

External Sorting: Techniques, multi-way merge sort, polyphase merge sort.

## Part C



# PBL ON DATA STRUCTURE

## Library Management System

- **Data Structures:** Linked Lists, Stacks, Queues, Trees (e.g., AVL Trees for indexing).
- **Project Overview:** Design and implement a system to manage book borrowing, returning, and inventory.
- **Tasks:**
  - Implement a linked list to manage the catalog of books.
  - Use stacks to handle book borrowing and returning history.
  - Implement queues for managing waitlists for popular books.
  - Use a tree structure for efficient search and categorization of books.

## 2. Social Network Analysis

- **Data Structures:** Graphs, Hash Tables.
- **Project Overview:** Analyze and model a social network to find connections, influencers, and communities.
- **Tasks:**
  - Represent the network using an adjacency list or adjacency matrix.
  - Implement algorithms to find the shortest path between users (e.g., Dijkstra's or BFS).
  - Use hash tables to efficiently manage user data.
  - Detect communities within the network using clustering algorithms.

## 3. E-commerce Recommendation System

- **Data Structures:** Hash Tables, Graphs, Trees (e.g., B-Trees for indexing).



- **Tasks:**

- Use linked lists to manage the sequence of messages.
- Implement Trie structures to allow fast search through the message history.
- Implement user management using hash tables.

## 9. Online Auction System

- **Data Structures:** Hash Maps, Heaps.

- **Project Overview:** Create an online platform for auctions with features like bidding and item management.

- **Tasks:**

- Use hash maps to manage auction items and user details.
- Implement heaps to manage bids and determine the highest bid efficiently.
- Develop real-time auction updates.

## 10. Hospital Management System

- **Data Structures:** Linked Lists, Queues, Trees.

- **Project Overview:** Design a system to manage patient records, doctor appointments, and hospital resources.

- **Tasks:**

- Use linked lists to maintain patient records.
- Implement queues to manage patient appointments.
- Use trees to classify and search medical records efficiently.

## Part D(Marks Distribution)

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	40	40	40

### 6. Memory Management Simulator

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	50	30	40	40

**Project Overview:** Simulate memory allocation and deallocation in an operating system.

#### Tasks:

- Books:** See link in syllabus to simulate free and allocated memory blocks. R. Kruse et al.
- Articles:** Implement algorithms for memory allocation (e.g., first fit, best fit). A.M. Tenenbaum, E. Horowitz, S. Sahani
- MOOC Courses:** Simulate fragmentation and defragmentation processes.

## Part E

### 7. Flight Reservation System

- Data Structures:** Graphs, Heaps.
- Project Overview:** Build a system to manage flight reservations, cancellations, and route optimization.
- Tasks:**
  - Represent flight routes using graphs.
  - Implement shortest path algorithms to find optimal routes.
  - Use heaps to manage reservation priority queues.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	2	2
CO2	2	3	1	-	-	-	-	-	-	-	-	2	2	2	1
CO3	2	3	1	-	-	-	-	-	-	-	-	2	2	3	1
CO4	2	3	1	-	-	-	-	-	-	-	-	2	2	3	1
CO5	2	1	-	-	-	-	-	-	-	-	-	2	3	2	2

### 8. Chat Application with Searchable Message History

- Data Structures:** Linked Lists, Trees (e.g., Trie for searching).
- Project Overview:** Develop a chat application with searchable message history and user management.

- **Project Overview:** Build a system to recommend products based on user behavior. **Syllabus-2023-2024**

- **Tasks:** (SOET)(MCA)

**Title of the Course** Use hash tables to store user preferences and product details.  
**Course Code** PHP  
 MCA-106[P]

- Implement collaborative filtering algorithms using graphs to find similar users.
- Use tree structures to organize and search products efficiently.

Year	1st	Semester	1st	Credits	L	T	P	C
					0	0	3	3

## 4. Real-Time Traffic Navigation System

**Course Type** Lab only  
**Course Category** Discipline Electives  
 • **Data Structures:** Graphs (for representing road networks), Priority Queues for Dijkstra's algorithm).

- **Project Overview:** Develop a system that provides real-time navigation and traffic updates.

• **Tasks:** CO1- To understand various syntax rules of any of programming language such as c/C++ (BL1-Remember)

**Course Outcomes & Bloom's Level**

- **CO2-** To understand Object Oriented concepts of PHP and various web development concepts including design a web, Execution of web pages on server and request handling and response generation. (BL2-Understand)
- **CO3-** To implement Html, PHP and java script for Programming and mysql for database connectivity and file system. (BL3-Apply)
- **CO4-** To analyze various Database error Handling techniques to learn how to improve the performance of the PHP application. (BL4-Analyze)
- **CO5-** To evaluate and compare various web application Development techniques using PHP concepts. (BL5-Evaluate)
- **CO6-** To develop solutions for real world problems using php and mysql programming. (BL6-Create)

## 5. Movie Database System

• **Tasks:** Entrepreneurship X

**Course Elements** SDG (Goals) SDG2(Zero hunger) SDG4(Quality education)  
 SDG1(Poverty) SDG3(Good health and well-being) SDG5(Gender Equality)  
 SDG7(Affordable and clean energy) SDG8(Economic growth) SDG9(Industry, innovation and infrastructure)  
 SDG10(Reduced inequalities) SDG11(Sustainable cities and communities) SDG12(Responsible consumption and production)  
 SDG13(Climate action) SDG14(Life below water) SDG15(Life on land)

- **Project Overview:** Create a searchable movie database with features like movie ratings, reviews, and genre classification.

- **Tasks:** Environment X

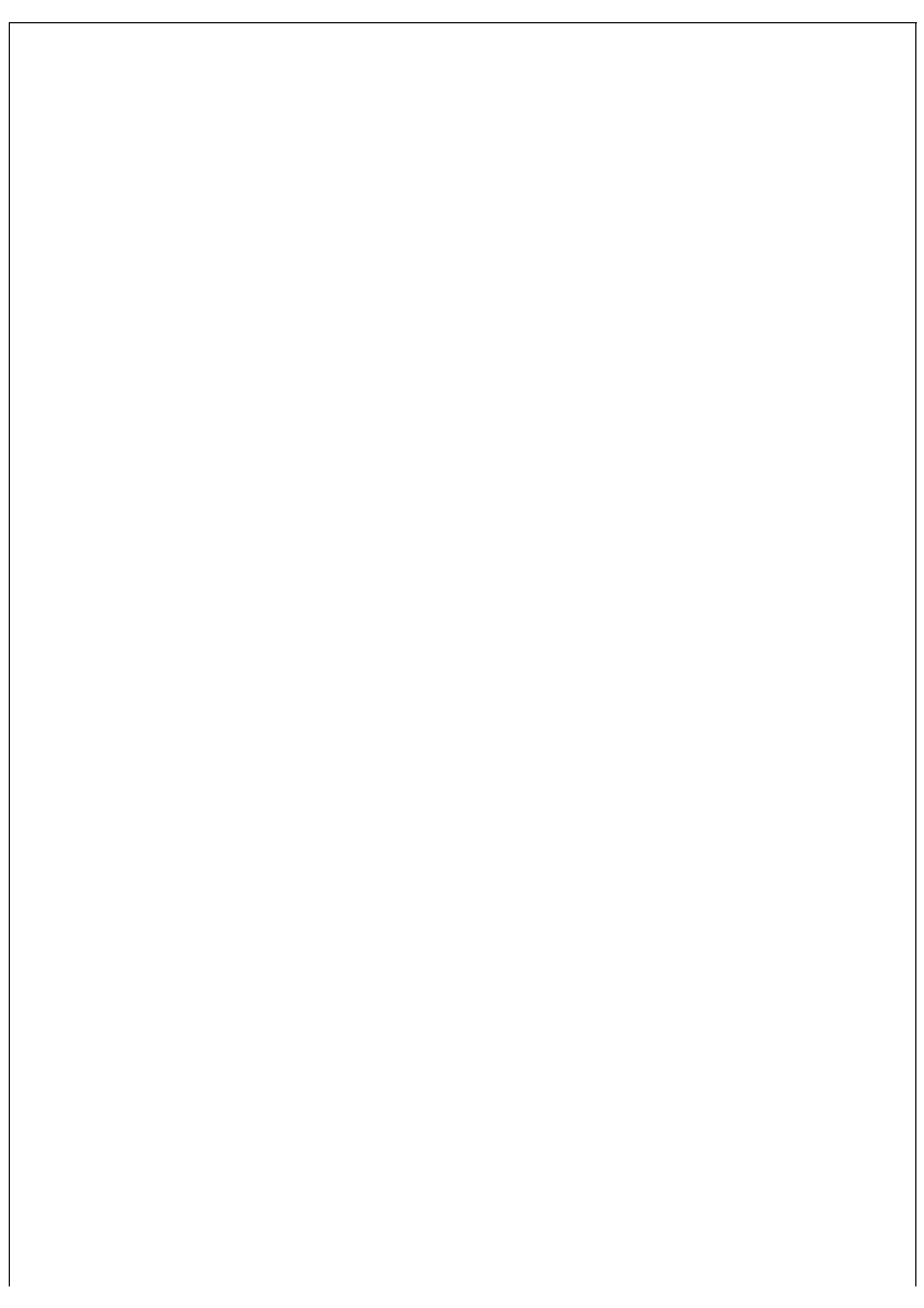
- Use trees to index movies for quick search by title, genre, or rating.

## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introducing PHP – history and Basic development Concepts, PHP delimiters, creating user defined variables, data types with php, type casting – Creating first PHP Scripts ,declaring and using constants, Using Variable and Operators ,– Storing Data in variable -Setting and Checking variables Data types, comments with php, useful readymade function of php. Controlling Program Flow: making decision with if, else and switch- writing More Complex Conditional Statements – Repeating Action with Loops and super global variables.</p>	<p>Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab</p>	8
2	<p>Use of html for web design-, html scripts and form elements, embedding php with html ,redirecting web pages, adding dynamic contents, Working with Numeric Functions. Working with Arrays: Storing Data in Arrays –Numerically index array, associative and multi-dimensional, array Processing Arrays with Loops and Iterations – Using Arrays with Forms - Working with Array Functions, Array sorting, converting array to scalar variables – Working with Dates and Times.</p>	<p>Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab</p>	8
3	<p>Introduction to file system- file system and uses, saving program data for later using for file system, opening a file, creating and writing to a file closing a file and deletion operation on file, reading data from a file, file handling functions. Processing Directories. String Handling: formatting strings, joining and splitting a string comparing strings matching and replacing substrings, string functions, introduction of php regular expression. Exception Handling: exception handling structure, try...catch...throw</p>	<p>Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab</p>	8
4	<p>Using php Functions and Classes: Introduction to functions. Creating User defined Functions-using parameters, returning values, calling by values versus calling by reference, use of include () and require () functions. Creating php Classes – Using Advanced OOP Concept, creating a php class, object and methods, operations, class attributes, class method invocation, php static hinting, object cloning, inheritance, final keyword, php abstract class and interface.</p>	<p>Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab</p>	8
5	<p>Working with Database : working on MYSQL database, connection php with mysql, creating database tables ,implementing insert delete, update and select query using php script, Session Handling: understanding basic session theory, setting cookies with php, starting a session, registration of</p>	<p>Lectures with whiteboard/PPT, Recorded video, Demonstrations Simulations lab</p>	10

session variables, accessing parameter using sessions, destroying variable and session.		
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## Part C



# PBL TOPICS

## PHP

### **1. Simple CMS (Content Management System):**

- Build a basic CMS using PHP where users can create, edit, delete, and manage content (e.g., articles, blog posts).
- Include features like user authentication, role-based access control, and a WYSIWYG editor for content creation.

### **2. Online Quiz System:**

- Develop an online quiz application where users can take quizzes on various topics.
- Implement features such as user registration, quiz creation, multiple-choice questions, scoring, and result display.

### **3. Online Task Management System:**

- Create a task management application where users can create tasks, assign them to others, set deadlines, and track progress.
- Include features like user authentication, task categorization, priority levels, and status updates.

### **4. E-commerce Website:**

- Build a simple e-commerce platform using PHP where users can browse products, add them to cart, and make purchases.
- Implement features like user registration, product catalog, shopping cart functionality, and payment integration (e.g., PayPal).

### **5. Online Student Information System:**

- Develop a student information system for managing student records, course details, grades, and attendance.
- Include features such as user authentication, student enrolment, course registration, and grade management.



### Part D(Marks Distribution)

#### Theory

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

#### Practical

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	VIKRAM VASWANI PHP A Beginner's Guide Tata McGraw Hill
<b>Articles</b>	Steven Holzner The PHP Complete Reference – Tata McGraw Hill
<b>References Books</b>	Lynn Beighley (Author), Michael Morrison (Author) Head Fist PHP & MySQL: A Brain-Friendly Guide O'Reilly Publication
<b>MOOC Courses</b>	
<b>Videos</b>	

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	-	-	1	2	3
CO2	1	3	-	1	-	-	-	-	-	-	-	-	2	1	2
CO3	-	-	2	1	-	-	-	-	-	-	-	-	3	2	1
CO4	1	2	-	2	-	-	-	-	-	-	-	-	2	2	1
CO5	-	2	1	1	-	-	-	-	-	-	-	-	2	1	1
CO6	-	2	-	-	-	-	-	-	-	-	-	-	3	1	1



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Software Engineering
<b>Course Code</b>	MCA 204

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	0	4
<b>Course Type</b>	Theory only							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	student must have knowledge about basic data structures , computer organization & programming language concepts.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember the basics of software engineering(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand the basics characteristics &amp; crisis of software and process of software engineering systems(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement various SDLC, ER, DFD models, to collect SRS, And understand the software.(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To Analyze various testing techniques and the concept of testing strategies(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate the need of Software Maintenance and Software Project Management Software, Need for Maintenance , Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering and other inter process communication tech An Overview of CASE Tools, Constructive Cost Models (COCOMO), Software Risk Analysis and Management .(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

## Part B

Modules	Contents	Pedagogy	Hours
unit-1	The software as product and a process, What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.	Lecturing	8
Unit-2	The software requirements documentation, System context, Requirements Definition & Evolution. Software Requirement Specification, Waterfall Model, Prototyping Model, Iterative Enhancement Model, Spiral Model, Role of Management in Software Development, Role of Metrics and Measurement, Problem Analysis, Requirement Specification, Validation, Metrics, Monitoring and Control	Lecturing	8
Unit-3	System Design principles, software design concepts: Functional v/s Object-Oriented Approach, Coding, Top-down & Bottom-up, Structured Programming, Information Hiding. Testing: Testing fundamentals, Levels of Testing, Test Plan, Test Cases Specification, Black box and white box testing	Case Study	8
Unit-4	The management activities – Configuration management, Versioning, Software management structures, programmer productivity. Software Project Management, Cost Estimation, Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring, Risk Management.	case study	8
Unit-5	Process quality assurance, quality reviews, Software reliability, ISO standards, SQA plan. Case Tools.	case Study	8

## Part C

### **Case Study Software Engineering**

1. Analysing the challenges and solutions for software maintenance: Students are required to identify the challenges appeared during software maintenance using various types of information gathering tools and must propose a systematic and feasible maintenance plan with output showing growth with respect to following points
  - User Satisfaction level
  - Software periodic update
  - Software Licence renewable
  - Software upgradability.
2. Perform automated testing and design customized test cases on any project modules. Also report the bugs encountered during testing phase and compute time incurred in rectifying bugs during testing phase. Compare the time involved in rectifying bugs at development phase and at testing phase.
3. You are required to build a Inventory management system for a departmental store, Prepare a logical design as well as use case and system flowcharts for the same.
4. You are required to build a Student information system for a departmental of school of Engineering, Prepare a logical design as well as use case and system flowcharts for the same.
- 5.
6. Compute the following using any project/modules of your choice
  - Product Metrics
  - Process Metrics
  - Project Metrics
7. Prepare a complete SRS report of a software that is not in existence as well as software that is already is being used but needs to be updated.



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Science with Python
<b>Course Code</b>	MCA 205 (A) (T)

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>				<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember the basic programming concept. <b>(BL1-Remember)</b></p> <p><b>CO2-</b> To understand the Basic concept of Data science, application areas and tools for data science <b>(BL2-Understand)</b></p> <p><b>CO3-</b> To implement Numpy for handling numerical data, pandas for handling data and basic and advanced visualization techniques to visualize the data. <b>(BL3-Apply)</b></p> <p><b>CO4-</b> To analyze the different domains of data, and perform cleaning and other preprocessing tasks on the data. <b>(BL4-Analyze)</b></p> <p><b>CO5-</b> To evaluate and summarize the data using statistical &amp; visualization tools; <b>(BL5-Evaluate)</b></p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG12(Responsible consumption and production)				

## Part B

Modules	Contents	Pedagogy	Hours
1	What is Data Science, The Many Paths to Data Science, What Makes Someone a Data Scientist, Advice for New Data Scientists, Applications of Data Science, Tools and techniques for Data Science.	lecturing	1
2	NumPy: Creating arrays, Array Indexing: Field access, Basic Slicing, Advanced indexing, Basic operations and manipulations, Broadcasting, Applications of Broadcasting. Pandas: Series, Dataframe, Reading and Writing Data from csv, text and excel file, Statistics Summarizations, Viewing Data using built in functions, Filter Data Frames based on value condition, Built in Functions for basic operations, Grouping of Data	lecturing,Experiment	1
3	Data Analysis Understanding the Domain, Understanding the Dataset, Python package for data science, Importing and Exporting Data in Python, Basic Insights from Datasets Cleaning and Preparing the Data: Identify and Handle Missing Values, Data Formatting, Data Normalization Sets, Binning, Indicator variables Summarizing the Data Frame: Descriptive Statistics, Basic of Grouping, ANOVA, Correlation, More on Correlation.	lecturing,Experiment	1
4	Introduction to Visualization Tools: Introduction to Data Visualization, Introduction to Matplotlib, Basic Plotting with Matplotlib, Line Plots, Area Plots, Histograms, Bar Charts Specialized Visualization Tools: Pie Charts, Box Plots, Scatter Plots, Bubble Plots.	lecturing,Experiment	1
5	Advanced Visualization Tools: Waffle Charts, Word Clouds, Seaborn and Regression Plots. Creating Maps and Visualizing Geospatial Data: Introduction to Folium, Maps with Markers, Choropleth Maps.	PBL	1





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Cryptography and Network Security
<b>Course Code</b>	MCA 205 (B) (T)

### Part A

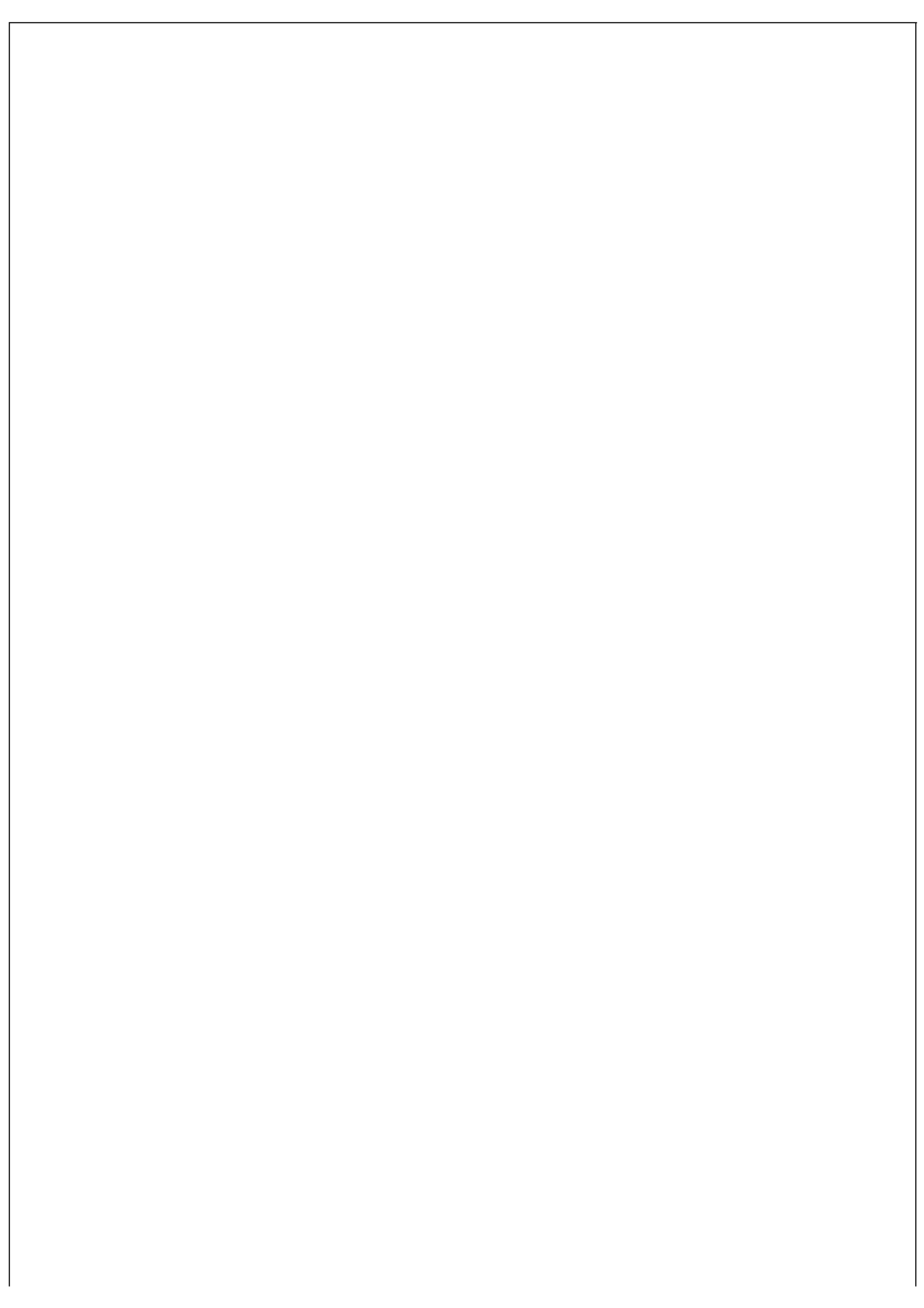
Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Basic knowledge of Discrete Mathematics, Number Theory, Pseudo Number, port numbers, TCP/IP and Computer Networks.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Remembering/Revising the basics of computer system, Computer networks and network security (<b>BL1-Remember</b>)</p> <p><b>CO2-</b> Understand the Cryptography and Encryption techniques and the concepts of Hashing (<b>BL2-Understand</b>)</p> <p><b>CO3-</b> Apply the various Symmetric and Asymmetric Key Encryption algorithms(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> Explain the various Encryption and Hashing techniques and analyze the concept of Digital Signatures, IP Security(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> Evaluating the various methods of Cryptography, Hash functions, Substitution and Transposition techniques(<b>BL5-Evaluate</b>)</p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introduction: Computer Security Concepts, The OSI Security Architecture, Cryptography Attacks, Security Services and Mechanisms, Security Attacks, types of attacks, Conventional Encryption: Classical Techniques, Substitution Techniques, Transposition Techniques, Stenography, Block Cipher Design Principles, Authorization Key, Viruses, phases of Virus, types of Viruses.</p>	Lecturing	8
2	<p>Introduction to Cryptography: Fundamentals Principles of Cryptography, Quantum cryptography, Introduction: Secret Key cryptography, Public Key Cryptography, Modern Techniques: Data Encryption Standard (DES), Triple DES, DES Standard, DES Strength, IDEA, Traffic Confidentiality, Key Distribution Random Number Generation.</p>	Lecturing, Experiments	8
3	<p>Public key Cryptography And Authentication: Public Key Encryption: Public-Key Cryptography: Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management, Public-Key Infrastructure (PKI), Fermat's &amp; Euler's Theorem, Other Algorithms: Diffie-Hellman. Authentication: Password based Authentication, Address based Authentication, Passwords as Cryptographic Keys, and Session Key Establishment.</p>	Lecturing, Experiments	8
4	<p>Hash function and Digital Signature: Message authentication and Hash function: Hash function, Applications of Cryptographic Hash Functions, Requirements, Security, Hash algorithm: MD5 message digest algorithm, Digital signature, Digital Signature Standard (DSS), X.509 certificates.</p>	Lecturing, Experiments	8

5	Web and System Security: Web- Security, Threats, Secure Sockets Layer (SSL), Electronic mail security: PGP, PEM, S/MIME, IP Security Overview, IP Security Architecture: Authentication Header, ESP, Kerberos, Firewalls, System Security, Secure Electronic Transactions (SET), mutual authentication, one and two-way public key based authentication.	Lecturing	8
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## Part C



## Activity I

### (Cryptography and Network Security)

Activity type: Review Article

Individual Activity

Mode of submission: online & Hard Copy

Maximum Marks: 15

#### Guidelines:

1. Each student must prepare a review article and presentation on the assigned topic / Domain.
2. Student Can Search Article at Following Link –
  - a. Google Scholar - <https://scholar.google.com/>
  - b. Web of Science - <https://mjl.clarivate.com/search-results>
  - c. SCI Hub - <https://sci-hub.se/>
3. Each student has to prepare the review article in IEEE paper format in a word file with at least 10 pages and 20 references and a power point presentation having at least 15 slides.  
Source : <https://www.ieee.org/conferences/publishing/templates.html>
4. The article must have plagiarism less than 15% checked using Turnitin Tool (Consult the faculty coordinator for the same)
5. Each paper should have at least 20 research paper references, all the references must be cited in IEEE format.  
(source : <https://researchmethod.net/references-in-research/>)
6. All the figures, diagrams, images or tables must also be cited.
7. This is an individual activity so each student has to work on a different topic.

## Activity II

### (Cryptography and Network Security)

Activity type: Seminar & Presentation

Individual Activity

Mode of submission: online & Hard Copy

Maximum marks: 10

#### Guidelines:

1. Each student must select a topic for presentation from the syllabus of MCA-205 cryptography.
2. Student must prepare a report and a presentation in power point on the selected topic covering the syllabus.
3. Each student has to prepare a report in word file with at least 10 pages and a power point presentation having at least 15 slides.
4. The time allocated for presentation to each of the student is 7 mins. And for Q/A 3 minutes.
5. The student must carry or arrange from the lab, the equipment / software / tools required for presentation on the day of respective activity.
6. The final hard copy submitted should be a file carrying all Introduction, Report and print out of ppt.
7. This is an individual activity so each student has to work on a different topic.

(Cryptography and Network Security)

Practical List

## Set – A

**Marks : 20**

**\*Submit their program code with screenshots of output by taking different- different inputs.**

- [1] Implement Caesar cipher (K=2) in any preferred language.
- [2] Implement monoalphabetic cipher in any preferred language.
- [3] W.A.P to implement Euclidean Algorithm
- [4] Implement Playfair cipher in any preferred language.
- [5] Implement Rail Fence technique (rail=2) in any preferred language.
- [6] W.A.P to implement Vigenère Algorithm
- [7] W.A.P to implement the DES Logic,
- [8] Implement the MD5 Algorithm.
- [9] W.A.P to implement the Digital Signature Algorithm
- [10] W.A.P to create a tool for encryption and decryption technique with time calculation.

## Set – B

**Marks : 20**

**\*Submit their program code with screenshots of output by taking different- different inputs.**

- [1] Implement Caesar cipher (K=2) in any preferred language.
- [2] Implement monoalphabetic cipher in any preferred language.
- [3] W.A.P to implement Euclidean Algorithm
- [4] Implement Playfair cipher in any preferred language.
- [5] Implement Rail Fence technique (rail=2) in any preferred language.
- [6] W.A.P to implement Vigenère Algorithm
- [7] W.A.P to implement the DES Logic,
- [8] Implement the MD5 Algorithm.
- [9] W.A.P to implement the Digital Signature Algorithm
- [10] W.A.P to create a tool for encryption and decryption technique with time calculation.





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Big Data
<b>Course Code</b>	MCA 205- C(T)

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Basic programming is needed to manipulate your data, and java is the base language to start with			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1- CO1:</b> To understand the fundamentals of Big Data. <b>(BL2-Understand)</b></p> <p><b>CO2- CO2:</b> To know about the different tools for Big Data and Visualization. <b>(BL2-Understand)</b></p> <p><b>CO3- CO3:</b> To explore tools and practices for big data and Visualization. <b>(BL3-Apply)</b></p> <p><b>CO4- CO4:</b> To recognize the role of business intelligence and visualization in decision making. <b>(BL4-Analyze)</b></p> <p><b>CO5- CO5:</b> To analyze data using Power BI, Tableau etc. <b>(BL5-Evaluate)</b></p> <p><b>CO6- CO6:</b> To prepare design dashboard for presenting analytics from data. <b>(BL6-Create)</b></p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG4(Quality education)				

## Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Big Data: Fundamentals of Big Data, defining big data, building successful big data management architecture, big data journey Big Data Types: Structured and unstructured data types, real time and non-real time requirements. Distributed Computing: History of distributed computing, basics of distributed computing	Lectures with whiteboard/PPT, Recorded video	6
Unit-2	Big Data Technology Foundation: Big Data stack, redundant physical infrastructure, security infrastructure, operational databases, organising data services and tools, analytical data warehouse, big data analytics Virtualization: Basics of virtualization, hypervisor, abstraction and virtualization, implementing virtualization with big data Cloud and Big Data: Defining cloud, cloud deployment and delivery models, cloud as an imperative for big data, use the cloud for big data	Lectures with whiteboard/PPT, Recorded video	10
Unit-3	Visualization: data visualization, appropriate data visualization technique for given data, design visualizations, dashboard Operational Databases: Relational database, nonrelational database, key-value pair databases, document databases, columnar databases, graph databases, spatial databases MapReduce Fundamentals: Origin of MapReduce, map function, reduce function, putting map and reduce together, optimizing map reduce.	Lectures with whiteboard/PPT, Recorded video	15
Unit-4	Hadoop: Discovering Hadoop, Hadoop distributed file system, Hadoop MapReduce, Hadoop file system, dataflow, Hadoop I/O, data integrity, compression, serialization, file-based data structure	Lectures with whiteboard/PPT, Recorded video	9
Unit-5	Introduction to Hadoop Ecosystem: Avro - Avro data types and schemas, in-memory serialization and deserialization, avro datafiles, schema resolution Pig- Comparison with databases, pig latin, user defined functions, data processing operators Hive-Running hive, comparison with traditional databases, HiveQL, tables, querying data, user defined functions	Lectures with whiteboard/PPT, Recorded video	5

### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1-3	Assignment	Experiments	BL3-Apply	2
1-4	Quiz	Experiments	BL3-Apply	1
1-5	Practical Assignment	Experiments	BL3-Apply	25
1-5	PBL	PBL	BL6-Create	35

### Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	Services, E. E. (2015, January 5). Data Science and Big Data Analytics.
<b>Articles</b>	Research on Big Data – A systematic mapping study: <a href="https://www.sciencedirect.com/science/article/abs/pii/S0920548917300211">https://www.sciencedirect.com/science/article/abs/pii/S0920548917300211</a>
<b>References Books</b>	Holmes, J. (2014, January 10). John Bowlby and Attachment Theory.
<b>MOOC Courses</b>	
<b>Videos</b>	Introduction to big data : <a href="https://archive.nptel.ac.in/courses/106/104/106104189/">https://archive.nptel.ac.in/courses/106/104/106104189/</a>

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	-	2	-	-	2	-	-	1	-	-
CO2	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	1	-	-	-	-	-	-	-	1	-	-
CO4	2	1	-	2	-	-	-	-	-	-	-	-	1	2	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-	2	3	-
CO6	1	-	1	-	-	-	-	-	-	-	-	-	2	2	-

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Minor Project I
<b>Course Code</b>	MCA 206

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					0	0	1	1
<b>Course Type</b>	Project							
<b>Course Category</b>	Projects and Internship							
<b>Pre-Requisite/s</b>	software development life cycle, Project life cycle, Knowledge of atleast one programming language,			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1- CO1</b> : Understand the project Development Life Cycle (<b>BL2-Understand</b>)</p> <p><b>CO2- CO2</b> : Apply the core discipline knowledge and develop a complete system for the given / chosen task(<b>BL3-Apply</b>)</p> <p><b>CO3- CO3</b> : Analyze the performance of the system developed using standard techniques for testing (<b>BL4-Analyze</b>)</p> <p><b>CO4- CO4</b> : Evaluate the performance of the system developed against the performance of similar tools./ systems (<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

### Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction:- Purpose of Database Systems, Views of data, Data Models, Database language, Transaction Management, Storage Management, Database Administrator, Database Users, Overall System Structure, Different types of Database Systems E-R Model: Basic Concepts, Design Issues, Mapping Constraints, Keys, E-R Diagram, Weak Entity set, Extended E-R features, Design of an E-R Database Schema, Reduction of an E-R schema to Tables.	Lectures with whiteboard/PPT,PBL	10



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Database Management System
<b>Course Code</b>	MCA-201 (T)

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	2	6
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Disciplinary Major							
<b>Pre-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			<b>Co-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Understand the data Warehouses, Operational Data Stores (ODS) and OLAP characteristics.(BL1)(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> Understand the data mining concept, application and their usage .(BL2)(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> Analyze the frequent patterns using association analysis algorithms like apriori, FP-growth. (<b>BL3-Apply</b>)</p> <p><b>CO4-</b> Understand the concept of classification, different classification algorithms (<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> Understand the concept of clustering and different cluster analysis(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

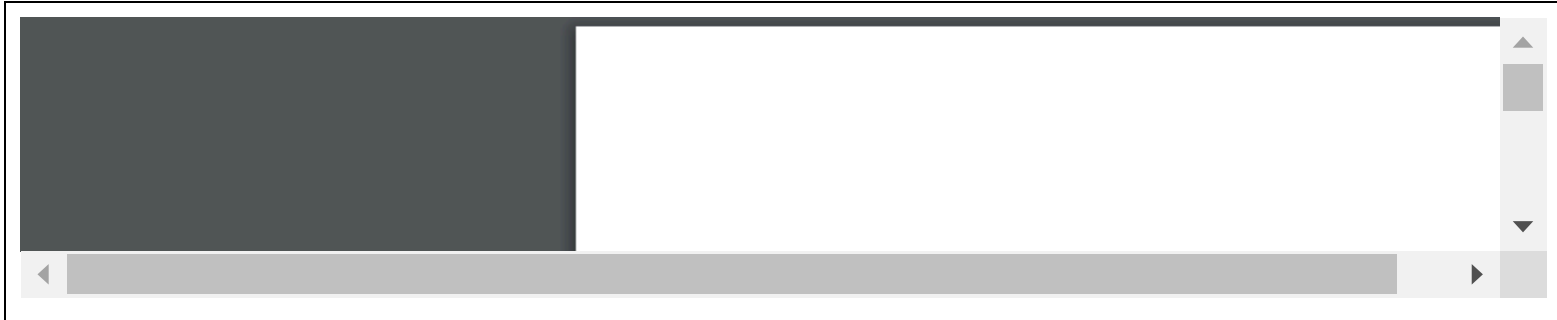
**Part B**

<b>Modules</b>	<b>Contents</b>	<b>Pedagogy</b>	<b>Hours</b>
1	<p>Introduction- Purpose of Database Systems, Views of data, Data Models, Database language, Transaction Management, Storage Management, Database Administrator, Database Users, Overall System Structure, Different types of Database Systems E-R Model: Basic Concepts, Design Issues, Mapping Constraints, Keys, E-R Diagram, Weak Entity set, Extended E-R features, Design Of an E-R Database Schema, Reduction of an E-R schema to Tables.</p>	LECTURING	10
2	<p>Relational Model: Structure of Relational Database, The Relational Algebra, The tuple relational calculus, The Domain Relational Calculus, Views SQL- Background, Basic Structure, SET operations, Aggregate functions, Null Values, Nested Sub queries, Derived Relations, Views, Modification of Database, Joined Relations, DDL, Other SQL features.</p>	LECTURING	9
3	<p>Relational Database Design- Pitfalls in Relational-Database Design, Decomposition, Normalization Using Functional Dependencies, and Normalization Using Multi valued Dependencies, Normalization Using Join Dependencies, Domain-Key Normal Form and Alternative Approaches to Database Design.</p>	CASE STUDY	8
4	<p>Transaction- Transaction Concepts, State, Implementations of Atomicity and durability, Concurrent Executions, Serializability, Recoverability, Transaction Definition in SQL.</p> <p>ACID Properties (Atomicity, Consistency, Isolation, Durability), SQL Data Types , SQL Oprators , Two-Phase Commit Protocol</p>	PBL	10



5	<p>Concurrency Control- Lock based protocol, Timestamp based protocol, Validation based protocol, Multiple Granularity, Multi version Schemes, Deadlock Handling, Insert and Delete operations, Concurrency in index structure Query Optimization.</p> <p>Optimistic vs. Pessimistic Concurrency Control</p>	LECTURING	8
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### Part C



### Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	Jiawei Han, Micheline Kamber Data Mining Concepts and Techniques Arun K. Pujari Data Mining Techniques
<b>Articles</b>	
<b>References Books</b>	M. H. Dunham Data Mining – Introductory and Advanced Topics
<b>MOOC Courses</b>	
<b>Videos</b>	



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Computer Graphics
<b>Course Code</b>	MCA-202(T)

### Part A

Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	Prerequisite: Basic understanding of computer fundamentals, programming in 'C', and mathematical concepts.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> To remember the various concepts of computer fundamentals. <b>(BL1-Remember)</b> <b>CO2-</b> To understand the Basic concept of Computer Graphics and Multimedia System <b>(BL2-Understand)</b> <b>CO3-</b> To implement various algorithms in C/C++ like DDA, Circle drawing etc. <b>(BL3-Apply)</b> <b>CO4-</b> : To analyze functioning of different computer graphics algorithms and various transformation techniques <b>(BL4-Analyze)</b> <b>CO5-</b> To evaluate the performance characteristics of various computer graphics algorithms. <b>(BL5-Evaluate)</b>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

## Part B

Modules	Contents	Pedagogy	Hours
unit-1	<p>Introduction: Application areas of Computer Graphics, overview of graphics systems, advantages &amp; disadvantages of computer graphics, video-display devices, raster-scan systems, random scan systems, Different Input and Hard Copy Devices, Graphics Softwares, Refresh &amp; storage Cathode-Ray Tubes.</p> <p>Interactive Graphics: Real-time graphics systems and their applications. Graphics Standards: GKS, PHIGS, OpenGL. Graphical User Interfaces (GUI): Basics and significance in modern computing. Display Processors: Role and function in graphics systems.</p>	Lecturing	9
Unit-2	<p>Output primitives: Points and lines, line drawing algorithms, Properties of circle, circle generation: Bresenham's and mid point circle drawing algorithm, Character Generation and its attributes, Aliasing and Anti-aliasing techniques.</p> <p>Filled area primitives: Scan line polygon fill algorithm, boundary fill and flood-fill algorithms.</p> <p>Polygon Drawing Algorithms, Curve Generation</p>	Lecturing	9
Unit-3	<p>2-D geometrical transformations: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms.</p> <p>3-D Geometrical transformations: Translation, rotation, scaling transformations, composite transformations.</p> <p>3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Curve Generation Clipping in 3D, Volume Rendering</p>	experiment	9
Unit-4	<p>2-D viewing: The viewing pipeline, viewing coordinate, window to view-port coordinate transformation, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm.</p> <p>3-D viewing: Viewing pipeline, viewing coordinates, view volume. Projection: Parallel and Perspective</p>	experiment	9

visible surface detection methods:  
Classification, back-face detection, depth buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

Unit-5

Illumination model and shading: Light sources, diffuse reflection, specular reflection, reflected light, texture, shadows, light intensity levels. Surface shading, gouraud shading, phong shading, Color Models like RGB, CMY, YIQ, HSV, HLS.  
Multimedia: Introduction to multimedia, multimedia system, its components, applications, multimedia hardware, Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG  
  
Graphics Programming: Introduction to shaders, GPU programming

experiment

9

## Part C

### **Experiment List of Computer Graphics**

1. Write a program to implement DDA line drawing algorithm
2. Write a program to implement Bresenham's line drawing algorithm
3. Write a program to implement Bresenham's circle drawing algorithm.
4. Write a program to draw an ellipse using Bresenham's algorithm.
5. Write a program to perform various transformations on line , square & rectangle.
6. Write a program to implement Cohen Sutherland line clipping algorithm.
7. Write a program to implement Liang-Bersky line clipping algorithm.
8. Write a program to implement Cohen-Sutheland polygon clipping algorithm to clip a polygon with a Pattern.
9. Write a program to convert a color given in RGB space to it's equivalent CMY color space.
10. Study of various Multimedia file formats:-RTF,MIDI,GIF,JPEG,MPEG,TIFF etc.



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Design and Analysis of Algorithms
<b>Course Code</b>	MCA-203

### Part A

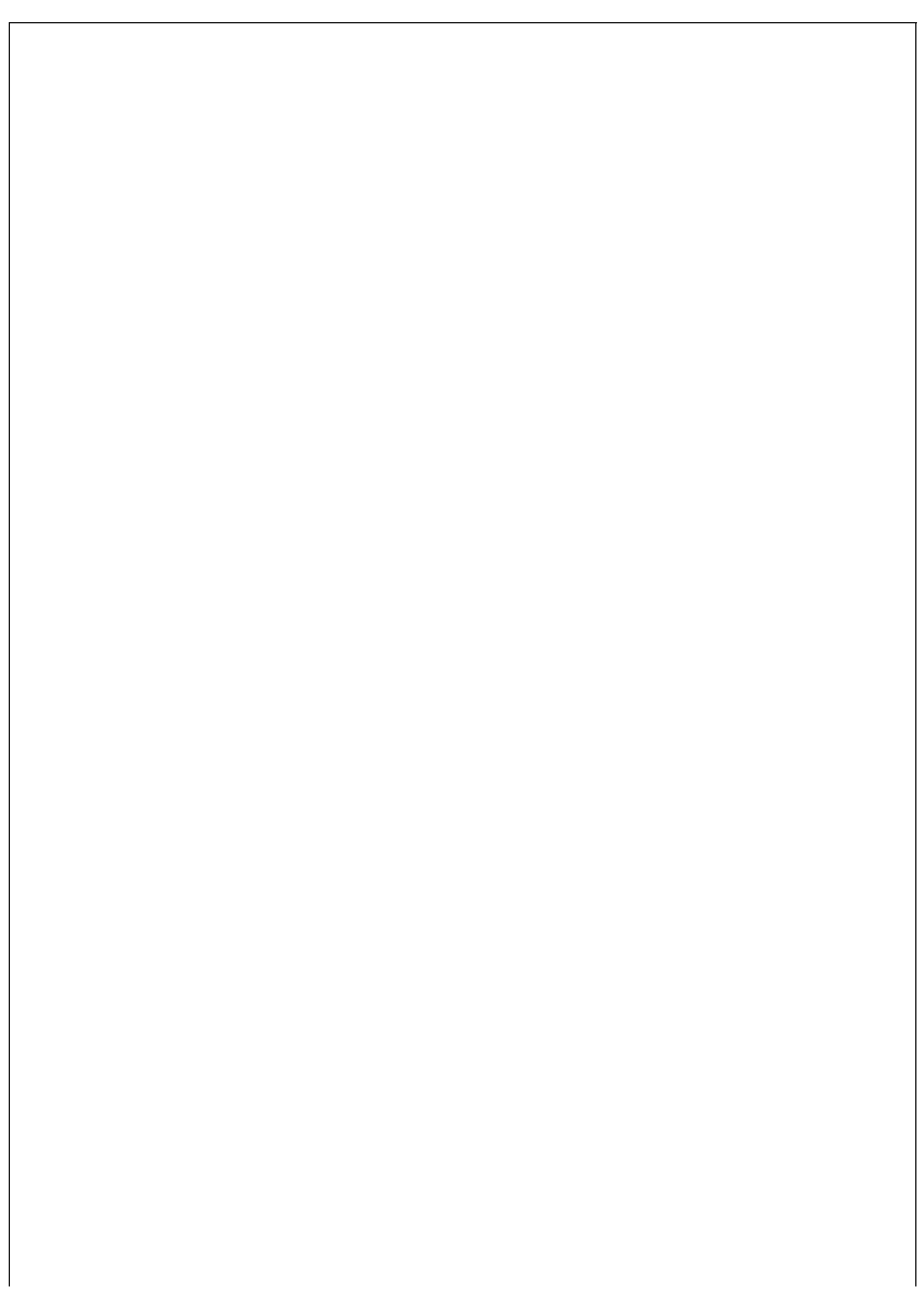
Year	1st	Semester	2nd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	Basic understanding of data, Information, Data Structures, Algorithms, and Algorithm Complexity			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember various concepts of data structures and algorithms. <b>(BL1-Remember)</b></p> <p><b>CO2-</b> To understand Basic concepts of algorithm representation techniques such as Pseudo codes and Flowcharts and analysis of the algorithm. <b>(BL2-Understand)</b></p> <p><b>CO3-</b> To Solve various problems based on the Divide and Conquer approach, Greedy approach, Backtracking, and Dynamic programming approach. <b>(BL3-Apply)</b></p> <p><b>CO4-</b> To illustrate various types of algorithmic approaches and problems based on them such as Strassen's matrix multiplication, Multistage graph, n- queens problem, minimum spanning tree problem, etc. <b>(BL4-Analyze)</b></p> <p><b>CO5-</b> To describe the performance of various algorithms using various complexity measuring techniques. <b>(BL5-Evaluate)</b></p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					



## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introductions and Fundamentals: Algorithms and their characteristics, models of computation, time space complexities, asymptotic analysis, average and worst case analysis.</p>	Lecturing	10
2	<p>Divide and Conquer: Control Abstraction of divide-and-conquer, examples: Binary-search, quick sort, Strassen's matrix Multiplication; Analysis of divide and conquer, run time, recurrence relations, Substitution method, Master Theorem</p>	Lecturing	10
3	<p>Dynamic programming: Overview, difference between dynamic programming and divide and conquer, Applications: Multistage graph, Shortest path in graph, Traveling salesman Problem. Greedy Method: Overview of the greedy paradigm, exact optimization solution (minimum cost spanning tree), Approximate solution (Knapsack problem), Single source shortest paths.</p>	Lecturing	8
4	<p>Backtracking: Overview, Sum of subset problem, Queen problem, and 0/1 Knapsack problem. Branch and bound: LC searching Bounding, application: 8 and 15 Puzzle Problems, 0/1 Knapsack problem, Traveling Salesman Problem</p>	Lecturing, PBL	8
5	<p>Computational Complexity: Complexity measures, Polynomial Vs non-polynomial time complexity; NP- and NP-complete classes, examples. Introduction to NP Completeness: The class P and NP, NP Completeness Problems, NP Hard Problems.</p>	Lecturing	9

## Part C



## Design & Analysis of Algorithms PBL List

### Guidelines for PBL:

1. PBL will be of 30 marks. 20 marks for Implementation and report submission and 10 marks for final presentation and viva-voce.
2. This is group activity. Each group will have maximum 05 students.
3. PBL synopsis will be submitted for approval and must be approved before going to start the work.
4. PBL report and implementation code will be submitted for final evaluation.
5. Students must showcase their implemented work of PBL and give the Final viva through the PPT.

### PBL 1:

#### Sudoku

In this game, the user has to put a number between 1-9 in one of the cells, however, the same number cannot appear twice in the same row, column, and 3x3 grid as well.

To implement this game, we can use a grid (2D array) for the game board and **backtracking** for the logic. By using this approach, we can explore different possible combinations of numbers until a valid solution is found.

- Project title: **Sudoku**
- Algorithms/DS involved: backtracking, 2D array

### PBL 2:

#### To-Do List

This project idea is great for beginner developers because here, we can also implement CRUD (Read-Create-Update-Delete) operations as well.

One of the ways to create a to-do list is using a **stack** data structure. This data structure follows the LIFO (last in - first out) method, so when we add a new task in our list, it will be on the top of the older tasks. For example, when removing a task, let's say we have task 1 (bottom), 2 (middle) and 3 (top) and we want to remove task 2, then task 3 will now be on top of task 1, so the order of their addition will remain.

- Project title: **To-Do list**
- Algorithms/DS involved: stack

### PBL 3:

#### Social Media Network

If you want to create a social media network project or something similar to this, then the best approach would be to use **graphs**. Each person would represent a **node** (vertex) and the relationships between them would be represented as **edges**. This relationship between them can be friendships, follows, likes, or comments.

- Project title: **Social Media Network**
- Algorithms/DS involved: graph

### PBL 4:

#### Library Management System

A library management system helps libraries manage and organize their resources (books, newspapers). To implement this type of project, we can use a **hash table** where we can represent the books and their information with key-value pairs. With this data structure, we can efficiently store and retrieve the key-value pairs and reduce the time complexity compared to other data structures.

- Project title: **Library Management System**
- Algorithms/DS involved: hash table

### PBL 5:

#### Maze

There are many ways to create maze games, we can create a maze generator only (which just generates the maze) or we can create a fully functional maze game where we can control a *sprite* for example to navigate through the maze.

To create the maze itself we can use a **graph** and for the maze navigation (to find the shortest path from the entrance to the exit) we can use the **breadth-first search** (BFS) algorithm. While using this algorithm, we can keep track of the parent node of each visited node. This allows us to reconstruct the path from the exit back to the entrance once the destination is reached.

- Project title: **Maze**
- Algorithms/DS involved: graph, breadth-first search (BFS)

#### **PBL 6:**

##### **Student Grade Checker**

A student grade checker project could use a **hash table** to store and retrieve student grades efficiently. Since this data structure stores key-value pairs, the keys could be the student's name or ID and then the value could be the grades. We could also implement functions to insert or delete grades from the table.

- Project title: **Student Grade Checker**
- Algorithms/DS involved: hash table

#### **PBL 7:**

##### **Flight Route Planner**

A flight route planner project determines the most efficient routes for flights between different airports. Using **graphs** in this project is really helpful, the airports could be represented as nodes and the flights between them could be represented as edges (the connections between the nodes).

- Project title: **Flight Route Planner**
- Algorithms/DS involved: graph

#### **PBL 8:**

##### **Web Crawler**

Web crawlers explore the internet and gather information from websites. It starts with a URL then it follows the links from the page to visit other pages. Here, we can use a **queue** data structure to store the visited websites. The easiest algorithm to use would be **breadth-first search** so that the crawler visits all the links from the current website first before moving on to other websites.

- Project title: **Web Crawler**
- Algorithms/DS involved: queue, breadth-first search (BFS)

#### **PBL 9:**

##### **File Compression Tool**

A **heap** can be used to optimize the compression process. A heap is a data structure that allows efficient retrieval of the smallest/largest element in a collection. In this case, a heap can be used to store and manage frequency counts of characters in the input file.

- Project title: **File Compression Tool**
- Algorithms/DS involved: heap

#### **PBL 10:**

##### **Real-Time Traffic Analysis**

With this project we can analyze and monitor traffic data in real time. The data can be collected from sensors, cameras, or GPS devices. **Segment trees** can be used to efficiently process and analyze traffic data. Once the data is collected and stored in the segment trees, we can make queries to retrieve information (for example, the average speed at a certain time interval).

- Project title: **Real-Time Traffic Analysis**
- Algorithms/DS involved: segment tree

#### **PBL 11:**

##### **Shopping Cart App**

It's quite easy to implement a shopping cart app with **arrays**. The shopping cart acts as a temporary container for the items that users want to purchase.

- Project title: **Shopping Cart App**
- Algorithms/DS involved: array

#### **PBL 12:**

##### **Word Frequency Counter**

With this project we can count the frequency of each word in a text. We can use a **hash table** to efficiently store and retrieve the key-value pairs. First, we would split the words into tokens (for example, split it with whitespace), then we can iterate over them and for each token we can compute a hash value using a hash function. If the token already exists in the table, then we can increment the frequency value by one.

- Project title: **Word Frequency Counter**
- Algorithms/DS involved: hash table

#### **PBL 13:**





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Warehousing and Mining
<b>Course Code</b>	MCA 301(T)

Part A

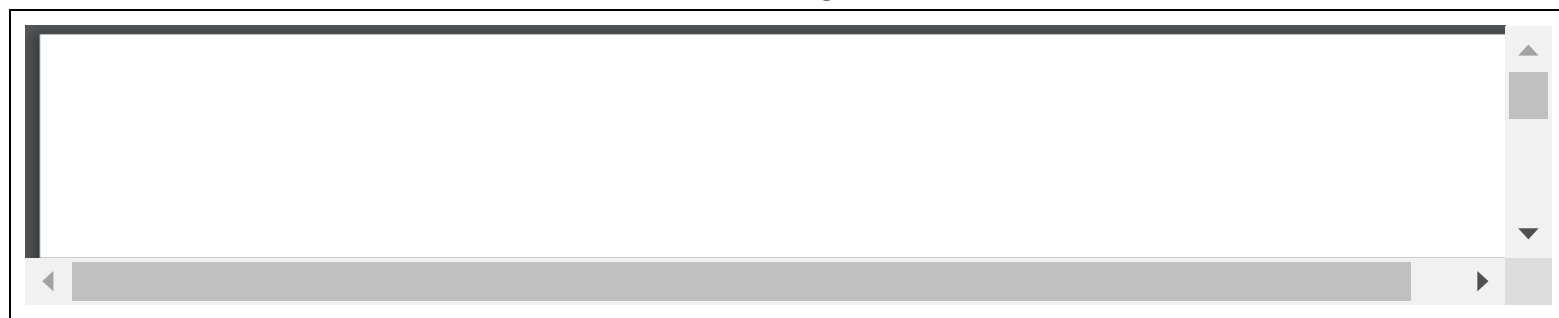
Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and field work							
<b>Course Category</b>	Disciplinary Major							
<b>Pre-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			<b>Co-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Understand the data Warehouses, Operational Data Stores (ODS) and OLAP characteristics.(BL1)(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> Understand the data mining concept, application and their usage .(BL2)(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> Analyze the frequent patterns using association analysis algorithms like apriori, FP-growth. (<b>BL3-Apply</b>)</p> <p><b>CO4-</b> Understand the concept of classification, different classification algorithms (<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> Understand the concept of clustering and different cluster analysis(<b>BL5-Evaluate</b>)</p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				



## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introduction to Data Mining, its importance, Kind of Data Mined, Data Mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining, Data Mining Primitives, Architecture of Data Mining Systems.</p> <p>Data mining tools and software (e.g., Weka, R, Python libraries)</p>	LECTURING	10
2	<p>Needs of Data Preprocessing, Data Cleaning, Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation. Data Warehouse Concepts: Architecture, Operations, Multidimensional Data Model, Data Warehouse Implementation, Data Cube Technology, Aggregation, OLAP Functions and Tools.</p> <p>Data warehousing :Data transformation and feature scaling</p>	LECTURING	9
3	<p>Association Rule Mining, Apriori Algorithm, Single Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transactional Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, Frequent pattern mining, Association rule mining applications (e.g., recommendation systems, market basket analysis)</p>	CASE STUDY	8
4	<p>Classification and Prediction Methods Comparison, Classification by Decision Tree Induction, Bayesian Classification, Classification by Association Rule Analysis. Clusters Analysis: Introduction, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods - Partitioning Methods: K-Means and K-Medoids, Hierarchical Methods: Agglomerative and Divisive, Overfitting and underfitting in classification</p>	PBL	10
5	<p>Applications of Data Mining: Mining Data Streams, Time Series Data, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining World Wide Web, Social Impacts of Data Mining, Real-time data mining and analytics.</p>	LECTURING	8

## Part C





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Cloud Computing
<b>Course Code</b>	MCA 302

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	0	4
<b>Course Type</b>	Theory only							
<b>Course Category</b>	Discipline Core							
<b>Pre-Requisite/s</b>	Students must be familiar with the concepts of Information Technology, Database Management Systems and Data Structures.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember the concepts of Cloud Computing, Virtualization, and data-intensive cloud computing.(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand the Basic concept of Computer networks, Cloud Computing, big data, and various Cloud Web Services for different applications.(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To apply various virtualization tools in cloud computing.(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To analyze the current issues in cloud computing like its security, energy efficiency, and data handling for different business areas.(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate and deploy various applications in a Cloud Computing environment to solve real-world problems.(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth) SDG13(Climate action)				

## Part B

Modules	Contents	Pedagogy	Hours
I	Overview of Cloud Computing : Vision of cloud computing, Defining a cloud, cloud computing reference model, Historical developments, Cloud computing services, types of clouds, Characteristics, benefits and cloud computing challenges.	Lecturing	8
II	Virtualization : Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Pros and cons of virtualization, Technology- Xen, VMware, Microsoft Hyper-V, Economics of the cloud, Federation, Presence, Identity, and Privacy in the Cloud-Federation in the Cloud, Presence in the Cloud, Privacy and Its relation to Cloud-Based Information Systems, Secure Software Development Life Cycle (SecSDLC).	Lecturing	9
III	High throughput Computing : Data-Intensive Computing-Introduction, characterizing data-intensive computations, Historical perspective, Challenges ahead, Technologies for data-intensive computing, Concept of multi-cloud management, Challenges in managing heterogeneous clouds, benefits and advantages of multi-cloud management systems. Implementing Multi-Cloud Management System (e.g. RightScale Cloud Management System).	Lecturing	10
IV	Business Clouds : Cloud Computing in Business, Various Biz Clouds focused on industry domains, Amazon Web Services, Google AppEngine, Microsoft Azure. Scientific Applications-Healthcare: ECG Analysis in the Cloud, Geoscience: Satellite Image Processing, Business and Consumer Applications- CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming.	Application Based Activity, Project Based Activity, Online Certification	10
V	Future directions in Cloud Computing : Future technology trends in Cloud Computing with a focus on Cloud service models, deployment models, cloud applications, and cloud security. Energy efficiency in clouds, Market-based management of clouds, Third-party cloud services, Current issues in cloud computing leading to future research directions.	Project Based Activity, Research Paper Writing	10



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Web Technologies
<b>Course Code</b>	MCA 303 (T)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Disciplinary Minor							
<b>Pre-Requisite/s</b>	basic knowledge computer file system.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember various Web Development Strategies and syntax rules of web Programming and PHP (<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand the basics of web architecture, Types of architecture, knowledge about web protocols and web development concepts of PHP(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement: HTML, CSS, JavaScript and XML , PHP and mysql language to create static and dynamic web pages and interactive web applications.(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To analyze various Client-side programming techniques(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate the web pages and layout with the help of Advanced CSS Techniques (<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Introduction to Web Development: Introduction to Web technology ,Websites for individual and Corporate World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development. Web Essentials: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response. History of the internet, internetworking concepts, architecture, and protocol: switch, router, protocols for internetworking, internet address and domains. working of web browser and web server, Web server and its deployment, N-tier architecture, services of web server, Common gateway interface (CGI), Uniform Resource Locator (URL), format of the URL.</p> <p>Web Hosting: Types of hosting, server management</p>	Lecturing	10
2	<p>Web Page Designing HTML: list, table, images, forms, Basics of HTML, formatting and fonts, commenting code, color, hyperlink, list, forms, XHTML, Meta tags, Character entities, frames and frame sets,Browser architecture and Web site structure. Overview and features of HTML5</p> <p>Microformats and RDFa: Embedding metadata in HTML</p>	Lecturing,experiments	10
3	<p>Style Sheets CSS-Introduction to Cascading Style Sheets, Features, Core Syntax, Style Sheets and HTML Style Cascading and Inheritance, Text Properties, Box Model, Normal Flow Box Layout, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding .lists, positioning using CSS, CSS2, Overview and features of CSS3</p> <p>Responsive Web Design: Media queries, flexible gridsAnimations and Transitions: CSS animations, keyframe</p>	Lecturing,Experiment	8
4	<p>Scripting Java script: Scripting Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; Introduction to client and server side scripting, data types, operators, conditional statement, loops in Java script, functions, arrays, objects and elements in Java script, form validation using Java script. Advance</p>	Lecturing,Experiment	9

script, Javascript and objects, Javascript own objects, the DOM and web browser environments, forms and validations  
DHTML: Combining HTML, CSS and JavaScript, events and buttons, controlling your browser

AJAX Introduction: Asynchronous JavaScript and XML

PHP (Hypertext Pre-processor): PHP Programming: Introducing PHP: Creating a PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

Object-Oriented PHP: Classes, Objects, Inheritance, Security in PHP: SQL Injection prevention, Input validation

5

Lecturing, Experiment

9



## EXPERIMENTS

1. Create a specimen of corporate web page. Divide the browser screen into two frames. The frame on the left will be a menu consisting of hypertext links. Clicking on any of these links will lead to a new page, which must open in a target frame which is on the right side.
2. Write a JavaScript code block, which validates a user name and password against hard-coded values. If either name or password field is not entered, display an error message showing "You forgot one of the required fields. Please try again". In case the field entered does not match the hard-coded values, display an error message showing: "Please enter a valid user name and password". If the field entered matches, display the following message: "Welcome (Username)".
3. Create a web page using two image files. Which switch between one another as the mouse pointer moves over the images.
4. Write a JavaScript Program to show use of following Events:
  - OnClick()
  - OnAbort()
  - OnLoad()
  - OnMouseOver()
  - OnMouseOut()
  - OnChange()
  - OnError()
5. Write a JavaScript Program for Exception Handling, including output.
6. Design a Dynamic Web page with validation in JavaScript.
7. Write a PHP script that accepts a temperature value in Celsius (C) through a Web form and converts it to the Fahrenheit (F) scale. The conversion formula to use is:  $F = (9/5) * C + 32$ .
8. Using only an array and a foreach loop, write a program that prints the days of the week.
9. Write a program that reads an array of numbers and returns a list of all those numbers less than 15.



# Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Block Chain
<b>Course Code</b>	MCA 304 -C (T)

## Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Specialization Elective Courses							
<b>Pre-Requisite/s</b>	Prerequisite: Students must be familiar with Cryptography Techniques, Data Structures and Algorithms, Introduction to Programming.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember Cryptography Techniques, Data Structures and Algorithms(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand the concept and working of blockchain technology, various application areas like cryptocurrency, digital ledger etc. And role of cryptography in blockchain.(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement the cryptography and mining to implement blockchain ledger and to implement security.(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To analyze the role of miner sin blockchain. Application of blockchain in multiple areasandhowitprovidessuchaneffectivesecuremechanismofhandlingandmaintainingdataorrecords(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate the performance characteristics of blockchain in comparisontoavailabletechnologiesandwhatfeaturesofblockchainmakeitsoeffective.(<b>BL5-Evaluate</b>)</p> <p><b>CO6-</b> To prepare a scenario to observe the performance evaluation of blockchain in comparison to contemporary technologies and to observe the potential application areas(<b>BL6-Create</b>)</p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗			<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education)			

## Part B

Modules	Contents	Pedagogy	Hours
1	Basic Cryptography: Fundamentals Principles of Cryptography, Secret Key cryptography, Public Key Cryptography, Hash function, Digital Signature. Distributed Database, Byzantine General problem and Fault Tolerance.	Lectures with white board/PPT, Recorded video/interactive videos	8
2	Introduction Overview of Blockchain, Public vs Private Blockchain, Application of Blockchain, Blockchain Hashing Algorithm, Hash pointer and Merkle tree, Blockchain Immutable Ledgers, P2P Network, Distributed P2P Network, Blockchain Mining Overview.	Lectures with white board/PPT, Recorded video/interactive videos	8
3	Understanding Blockchain with Cryptocurrency Bitcoin and Block chain, Bitcoin monetary policy, Bitcoin Mining Work, Working with Consensus in Bitcoin, Proof of Work (PoW), Proof of Stack (PoS), Mining Pool, Nonce Range, Timestamp, Mem pool.	Lectures with white board/PPT, Recorded video/interactive videos	8
4	Understanding Blockchain for Enterprises Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, Enterprise application of Blockchain: Cross border payments, Know Your Customer (KYC), Food Security, Mortgage over Blockchain, Blockchain enabled Trade	Lectures with white board/PPT, Recorded video/interactive videos	8
5	Blockchain application development Hyperledger Fabric Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, writing smart contract using Hyperledger Fabric, writing smart contract using Ethereum.	Lectures with white board/PPT, Recorded video/interactive videos	8

## Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1-2	Assignment	Experiments	BL2-Understand	7
3-4	Activity	Experiments	BL3-Apply	8
1-5	Project	PBL	BL6-Create	20

### Part D(Marks Distribution)

#### Theory

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	

#### Practical

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	MelanieSwan BlockChain:BlueprintforaNewEconomy O'Reilly
<b>Articles</b>	DanielDrescher BlockChainBasics Apress;1stedition
<b>References Books</b>	ImranBashir Mastering Block Chain: DistributedLedgerTechnology,Decentralization and SmartContractsExplained PacktPublishing
<b>MOOC Courses</b>	
<b>Videos</b>	

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	2	1	-	2	-	-	-	-	-	-	2	1	3
CO2	-	1	2	1	1	-	-	-	-	-	-	-	1	2	-
CO3	-	1	2	1	1	2	-	-	-	-	-	-	1	2	1
CO4	-	-	1	-	-	1	-	-	-	-	-	-	2	1	1
CO5	-	2	2	-	1	2	-	-	-	-	-	-	1	2	3
CO6	-	2	1	-	1	-	-	-	-	-	-	-	1	2	-

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Cyber Security fundamentals and Cyber Audit Essentials
<b>Course Code</b>	MCA 304(B) (T)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Knowledge of Computer Network , Computer Architecture , Digital principals is essential			<b>Co-Requisite/s</b>	Knowledge of internet browsers and virtual eenvironment creation is must			
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Understand the cybercrimes, Various attacks performed on network and technique of auditing the digital devices <b>(BL1-Remember)</b></p> <p><b>CO2-</b> Apply the principles of identification of crimes and apply it to prepare the audit report. <b>(BL2-Understand)</b></p> <p><b>CO3-</b> Analyze the data from digital devices for forensic analysis and finalize the audit report <b>(BL4-Analyze)</b></p> <p><b>CO4-</b> Evaluation of various crimes and the techniques applied to perform the crimes in digital world. <b>(BL5-Evaluate)</b></p> <p><b>CO5-</b> Create automated applications for detection of crimes <b>(BL6-Create)</b></p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit I	Introduction to Cyber Crime and Cyber Laws Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Cyber Laws and Ethics.	Lectures with whiteboard/PPT, Recorded video/interactive videos	10
Unit II	Cyber Crime Issues and Investigation Unauthorized Access, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses, Investigation Tools, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Search and Seizure of Computers, Password Cracking .	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	12
Unit III	Biometric Systems and its Security Biometric fundamentals, Biometric technologies, Biometrics Vs traditional techniques, Biometric System and Security essentials, Privacy Issues in Biometric Security, Standards in Biometric security,	Lectures with whiteboard/PPT, Recorded video/interactive videos, Case sTudy	9
Unit IV	Digital Evidence Cyber crime and digital evidence: what is cyber crime, types of cyber crimes, digital evidence, Digital Vs Physical Evidence, Nature of Digital Evidence, Precautions while dealing with Digital Evidence, Digital Evidence Collection, Evidence Preservation, Recovering Deleted Evidences,	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	11
Unit V	Digital Auditing Cyber Audit Essentials, Compliance Audit, International Standards, ISO27001, Audit of Windows Systems, Audit of Linux systems, Audit of network devices (Switch/Servers), Audit of Websites and Web Applications. Steps for hardening your System. Preparation of an Audit Report.	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	10





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Analytics
<b>Course Code</b>	MCA 305(A) (T)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>				<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> To understand the fundamentals of Big Data.( <b>BL1-Remember</b> ) <b>CO2-</b> To know about the different tools for Big Data and Visualization.( <b>BL2-Understand</b> ) <b>CO3-</b> To explore tools and practices for big data and Visualization.( <b>BL3-Apply</b> ) <b>CO4-</b> To recognize the role of business intelligence and visualization in decision making.( <b>BL4-Analyze</b> ) <b>CO5-</b> To analyze data using Power BI, Tableau etc.( <b>BL5-Evaluate</b> ) <b>CO6-</b> To prepare design dashboard for presenting analytics from data.( <b>BL6-Create</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

## Part B

Modules	Contents	Pedagogy	Hours
Unit I	Big Data: Fundamentals of Big Data, defining big data, building successful big data management architecture, big data journey Big Data Types: Structured and unstructured data types, real time and non-real time requirements. Distributed Computing: History of distributed computing, basics of distributed computing	Lecturing , disdcussion	6
Unit II	Visualization: data visualization, appropriate data visualization technique for given data, design visualizations, dashboard Operational Databases: Relational database, nonrelational database, key-value pair databases, document databases, columnar databases, graph databases, spatial databases MapReduce Fundamentals: Origin of MapReduce, map function, reduce function, putting map and reduce together, optimizing map reduce.	lecturing	9
Unit III	Hadoop: Discovering Hadoop, Hadoop distributed file system, Hadoop MapReduce, Hadoop file system, dataflow, Hadoop I/O, data integrity, compression, serialization, file-based data structure Chaining.	lecturing,Experiment	10
Unit IV	Data Aggregation and Group operations: Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation. Time Series Data Analytics: Date and Time Data Types and Tools, Time series Basics, date Ranges, Frequencies and Shifting, Time Zone Handling, Periods and Periods Arithmetic, Resampling and Frequency conversion, Moving Window Functions.	lecturing,Experiment	9
Unit V	Introduction to Hadoop Ecosystem: Avro - Avro data types and schemas, in-memory serialization and deserialization, avro datafiles, schema resolution Pig-Comparison with databases, pig latin, user defined functions, data processing operators Hive-Running hive, comparison with traditional databases, HiveQL, tables, querying data, userdefined functions Spark: Resilient distributed datasets, shared variables, anatomy of a spark job run, executors and cluster managers, HBase: HBasics, concepts, clients, HBase vs RDBMS, Praxis	lecturing,Experiment	9

ZooKeeper: ZooKeeper services, building application with ZooKeeper

5

PBL

8

### Part D(Marks Distribution)

#### Theory

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	

#### Practical

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	Big Data Fundamentals: Concepts, Drivers & Techniques (The : Prentice Hall)
<b>Articles</b>	
<b>References Books</b>	Chris Eaton, Dirk Deroos et al. , “Understanding Big data”, McGraw-Hill.
<b>MOOC Courses</b>	
<b>Videos</b>	

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	1	1	-	-	-	-	-	-	-
CO2	-	-	1	1	1	1	-	-	-	1	1	1	-	-	-
CO3	-	-	1	-	1	-	1	-	1	1	1	-	-	-	-
CO4	1	1	1	1	1	1	-	-	-	-	-	1	-	1	-
CO5	-	-	-	-	1	1	1	1	-	1	-	1	-	1	-
CO6	1	-	-	-	1	-	1	-	1	-	1	1	-	1	-

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Digital Forensic and Analytics
<b>Course Code</b>	MCA 305(B) (T)

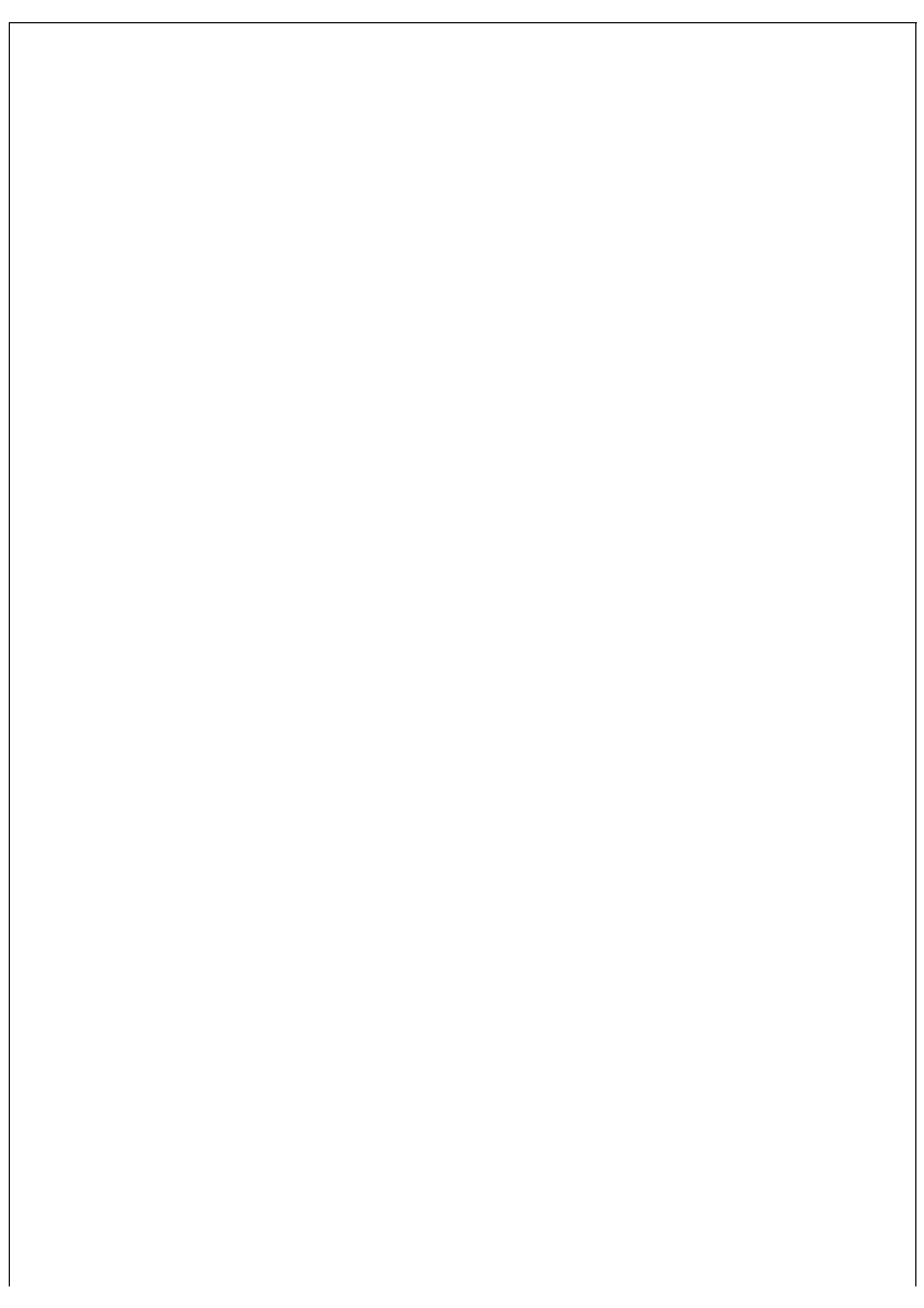
### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Basic knowledge of computer fundamentals, hardware, algorithms and basic concepts of network.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> Remembering Computer Network basics and Network Defense Essentials(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> Understand the concepts of Digital Forensics Digital investigation, Digital crime scene Evaluation process(<b>BL2-Understand</b>)</p> <p><b>CO3-</b> Apply to the identification of crime and investigate (apply).(<b>BL3-Apply</b>)</p> <p><b>CO4-</b> Analyze the data from digital devices for forensic analysis and finalize the audit report(Analyse)(<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> Evaluating Evaluation of various crimes and the techniques applied to perform the crimes in digital world.(Investigate)(<b>BL5-Evaluate</b>)</p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth) SDG10(Reduced inequalities)				

## Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Digital Forensics: Digital investigation, Digital crime scene evaluation process, Search & Seizure, Digital Forensic Lab Setup, Dead v/s Live Forensics, Types of Digital Evidences, Disk Imaging, Write Blockers, Data Recovery, Chain of Custody, Standard Operating Procedures, Investigation Guidelines, overview of tools, Slack Space, Virtual paging, Volatile Evidence Acquisition, Collection & Analysis	Lecturing, Experiments,	7
2	Volume Analysis & File Systems Introduction, PC based partitions- DOS partitions, UNIX partitions, RAW partition, UNIX Console Log, Removable media, Server based partitions- BSD partitions, GPT & MBR partitions, multiple disk volumes- RAID, Disk Spanning, file system, File system category, FAT concepts and analysis, FAT data structure- Boot sector, FAT 32 FS info, Directory entries, Long file name directory entries, NTFS File System concepts, NTFS Analysis, NTFS data structure, Standard file attributes, Index attributes and data structures	Lecturing, Experiments, Case Study	8
3	Digital Evidence Analysis Potential Evidences, Evidence collection from different devices, Artifact interpretation, Operating System artifacts analysis, Network Artifacts analysis, File Signatures, Registry Forensics, Last user Activity, MRU, NTUSER.DAT, MFT concepts, MFT Forensics, Multimedia Forensics, Metadata Analysis, Browser Forensics, History Extraction, Cookies based artifacts, Autofill Forms, Cache, Temp file, MAC OS Artifacts analysis, Linux OS Artifact Analysis	Lecturing, Experiments, Case Study	10
4	NIX File Systems UNIX, Ext2 and Ext3 data structures, iNodes, Super block, group descriptor tables, Block bitmap, Extended attributes, Directory Entry, Symbolic Link, Hash trees, Journal data structures, UFS1 and UFS2 concepts and analysis, NFS Files Systems, HFS File Systems, CDF File systems, Hadoop File systems	Lecturing, Experiments, Case Study	10
5	Forensic Tools Forensic tools collection, Automated v/s manual techniques, Open source forensic tools, Developing scripted tools for basic level investigation, Usage tools for disk imaging and Data recovery, Encase and FTK tools, Autopsy, UFED, XRY, Volatility, Rekall, RedLine, Network Miner, Anti forensics Techniques, Counter anti forensics.	Lecturing, Experiments, Case Study	10

## Part C



## **Activity I**

### **(Digital Forensic and Analytics)**

#### **Activity type: Survey**

#### **Individual Activity**

#### **Guidelines:**

1. Create a questionnaire for testing general cyber security measures a layman should adopt . Each question in the questionnaire should contain one mark and should have four options for answer. No descriptive questions should be there in the questionnaire.
2. The questionnaire should contain 25 questions related to using safety measures an individual should take to safe guard his / her laptop / mobile/ tab etc.
3. In addition to these questions the questionnaire should also contain following questions which should have descriptive questions: Name, City, state, age as on 1.07.2023, gender, profession (This should be a dropdown list having following options: home maker, Service, Self-employed, student, teacher), phone no./ email id
4. The questionnaire should be shared with at least 50 people and at least 40 entries should be recorded.
5. This assignment should be created as a goggle form and the form as well as the excel sheet of responses should be uploaded as submission.
6. This is an individual activity and not a group activity.



**Activity II**  
**Digital Forensic and Analytics**  
**Case Study**

**Guidelines:**

1. This is an individual activity.
2. Please refer to the following list of web application threats and select any three of them:

**Web Application Threats**

01 Cookie Poisoning	07 Cross-Site Scripting (XSS)	13 Information Leakage
02 SQL Injection	08 Sensitive Data Exposure	14 Improper Error Handling
03 Injection Flaws	09 Parameter/Form Tampering	15 Buffer Overflow
04 Cross-Site Request Forgery	10 Denial of Service (DoS)	16 Insufficient logging and monitoring
05 Directory Traversal	11 Broken Access Control	17 Broken Authentication
06 Unvalidated Input	12 Security Misconfiguration	18 Log Tampering

3. Document the following about the threats selected:
  - a. Attack Surface(s)
  - b. Attack Vector(s)
  - c. Methodology used for attack in form of block diagram
  - d. An example or case study of this kind of attack performed
  - e. Ways/methods/ tools/ command to detect the attacks in following environment:
    - i. Window's
    - ii. Linux
4. Comparative analysis of the attacks under consideration on following parameters:
  - a. Attack surfaces used
  - b. IOC
  - c. Possible Damage level
5. The report should be in MS- word format on an A-4 size paper.
6. The report should be submitted in soft copy online as well as hard copy



## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Full Stack Development
<b>Course Code</b>	MCA 305- C( T)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	To become knowledgeable about the most recent web development technologies and learn core concept of both front end and back end programming.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> To remember about the front end and back end Tools.( <b>BL1-Remember</b> ) <b>CO2-</b> To understand the basics of web architecture, find and use code packages based on their documentation to produce working results in a project( <b>BL2-Understand</b> ) <b>CO3-</b> Implementation of web application employing efficient database access. ( <b>BL3-Apply</b> ) <b>CO4-</b> Create web pages that function using external data and analyze them.( <b>BL4-Analyze</b> ) <b>CO5-</b> To develop a fully functioning website and deploy on a web server.( <b>BL5-Evaluate</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG8(Decent work and economic growth) SDG12(Responsible consumption and production)				

## Part B

Modules	Contents	Pedagogy	Hours
1	<p>Web Development Basics: Web development Basics - HTML &amp; Web servers Shell - UNIX CLI Version control - Git &amp; Github HTML, CSS</p> <p>Web storage and caching</p>	Lecturing	10
2	<p>Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format. JavaScript design patterns and principles</p>	Lecturing & Experiments	8
3	<p>REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication, Introduction to React Native and mobile app development</p>	Lecturing & Experiments	9
4	<p>Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application using Maven, Containerization using Docker</p>	Lecturing & Experiments	10
5	<p>Databases &amp; Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud, Database performance optimization techniques</p>	Lecturing & Experiments	9

## Part C



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## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Minor PProject
<b>Course Code</b>	MCA 306

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					0	0	3	3
<b>Course Type</b>	Project							
<b>Course Category</b>	Projects and Internship							
<b>Pre-Requisite/s</b>	sofetware development life cycle, Project life cycle			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1- CO1</b> : Understand the project Development Life Cycle ( <b>BL2-Understand</b> ) <b>CO2- CO2</b> : Aplly the core discipline knowledge and develop a complete system for the given / chosen task( <b>BL3-Apply</b> ) <b>CO3- CO3</b> : Analyze the performance of the system developeed using standard techniques for testing ( <b>BL4-Analyze</b> ) <b>CO4- CO4</b> : Evaluate the performacne of the system developeed against the performance of similar tools./ systems ( <b>BL5-Evaluate</b> )							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

### Part B

Modules	Contents	Pedagogy	Hours
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## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Warehousing and Mining
<b>Course Code</b>	MCA301 (P)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Disciplinary Major							
<b>Pre-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			<b>Co-Requisite/s</b>	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To remember the techniques of Data mining which help to extract the meaningful data. <b>(BL1-Remember)</b></p> <p><b>CO2-</b> To understand the basics of Data warehouse, Data marts, data Preprocessing and techniques of data mining. <b>(BL2-Understand)</b></p> <p><b>CO3-</b> To implement the various methods of data mining for data clustering, classification: K-means, K-Medoids etc. <b>(BL3-Apply)</b></p> <p><b>CO4-</b> To analyze the concepts of data Preprocessing, Association Rule Mining, classification, clustering. <b>(BL4-Analyze)</b></p> <p><b>CO5-</b> To evaluate the data mining models that run efficiently. <b>(BL5-Evaluate)</b></p> <p><b>CO6-</b> To create the dominant data mining algorithms; demonstrate an appreciation of the importance of paradigms from the fields of Artificial Intelligence and Machine Learning to data mining; explore the developing areas - web mining, text mining etc <b>(BL6-Create)</b></p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

### Part B

Modules	Contents	Pedagogy	Hours
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### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Assignment	PBL	BL2-Understand	15
2	QUIZ	Experiments	BL3-Apply	15

### Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	0
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	30	40	0

### Part E

<b>Books</b>	Data Mining Concepts and Techniques
<b>Articles</b>	
<b>References Books</b>	Data Mining – Introductory and Advanced Topics
<b>MOOC Courses</b>	
<b>Videos</b>	

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	1	-
CO2	-	1	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	-	-	-	-	-	-	-	-	-	-	-	3	2	3
CO4	2	1	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	-	1	1
CO6	2	2	-	-	-	-	-	-	-	-	-	-	1	-	1

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Machine Learning
<b>Course Code</b>	MCA304A(T)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>	Basic understanding of Statistical Data Analysis and visualization methods, and Python Programming.			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1-</b> To understand Basic concept of machine learning, various machine learning models(<b>BL1-Remember</b>)</p> <p><b>CO2-</b> To understand various Performance evaluation techniques of Machine Learning models. (<b>BL2-Understand</b>)</p> <p><b>CO3-</b> To implement various supervised, unsupervised and reinforcement machine Learning Models (<b>BL3-Apply</b>)</p> <p><b>CO4-</b> To train &amp; test various machine Learning models using different domains of dataset. (<b>BL4-Analyze</b>)</p> <p><b>CO5-</b> To evaluate and summarize the performance of various machine learning models using statistical &amp; visualization tools(<b>BL5-Evaluate</b>)</p> <p><b>CO6-</b> To create machine learning models to solve real world problems.</p>							
<b>Coures Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

**Part B**

<b>Modules</b>	<b>Contents</b>	<b>Pedagogy</b>	<b>Hours</b>
1	Introduction of Machine Learning: What is Machine Learning, Need for Machine Learning, Why & When to Make Machines Learn?, Machine Learning Model, Challenges in Machines Learning, Applications of Machines Learning, Overview of various machine Learning Algorithms, Performance evaluation measures for machine learning algorithms, the curse of dimensionality, Data Feature Selection, Training Data vs. Validation Data vs. Test Data for ML Algorithms, bias-variance trade off, over fitting vs under fitting.	Lectures with whiteboard/PPT, Experiments	9
2	Supervised Learning-I Regression: Introduction to Regression, Types of Regression Models, Introduction to Linear Regression, Simple Linear Regression, Least square regression, Gradient Descent , Multiple Linear Regression (MLR), Regularization in Linear Regression, Ridge regression, Lasso regression, Polynomial Regression, Support Vector for Regression (SVR).	Lectures with whiteboard/PPT, Experiments	10
3	Supervised Learning-II Classification – Introduction to Classification, Types of Learners in Classification, Logistic Regression, K-Nearest Neighbors (K-NN), Support Vector Machine (SVM), Kernel SVM, Naive Bayes, Decision Tree Classification, Random Forest Classification.	Lectures with whiteboard/PPT, Experiments	9
4	Unsupervised Learning Clustering- Introduction to Clustering, Types of Clustering, Types of Clustering Algorithms, K-Means Clustering, Hierarchical Clustering, DBSCAN Clustering, Association Rule Learning: Introduction to Association Rule Learning, Types of Association Rule Learning, Apriori Algorithm, Eclat Algorithm, F-P Growth Algorithm, Applications of Association Rule Learning.	Lectures with whiteboard/PPT, Experiments	9
5	Reinforcement Learning: Introduction of Reinforcement Learning, Terms used in Reinforcement Learning, Key Features, Elements of Reinforcement Learning, How does Reinforcement Learning Work?, The Bellman Equation, Types of Reinforcement learning, Markov Decision Process, Reinforcement Learning Algorithms, Reinforcement Learning Applications Performance Improvement of ML Models: Performance Improvement with Ensembles, Ensemble Learning Methods, Bagging Ensemble Algorithms, Boosting Ensemble Algorithms, Voting Ensemble Algorithms.	Lectures with whiteboard/PPT, Experiments	8

### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Implementation of various performance evaluation techniques of machine learning	Experiments	BL3-Apply	02
2	Implementation of various regression models of machine learning	Experiments	BL3-Apply	04
3	Implementation of various classification models of machine learning	Experiments	BL3-Apply	03
4	Implementation of various clustering models of machine learning	Experiments	BL3-Apply	03
5	Implementation of RL, bagging and boosting models of machine learning	Experiments	BL3-Apply	03
1-5	Problem Based Learning for real world problems	PBL	BL6-Create	15

### Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	Andreas C. Müller, Sarah Guido.(2016).Introduction to Machine Learning with Python: A Guide for Data Scientists.1st ed.O'Reilly Media.
<b>Articles</b>	
<b>References Books</b>	Tom M. Mitchell.(2017).Machine Learning.1st ed.McGraw Hill Education. Dr S. Sridhar, Dr M. Vijayalakshmi.(2021).Machine Learning.1st ed. Oxford University Press. Manaranjan Pradhan, U Dinesh Kumar.(2019).Machine Learning using Python.1st ed. Wiley India.
<b>MOOC Courses</b>	Prof. S. Sarkar.(2023).Introduction to Machine Learning, IIT Kharagpur. <a href="https://nptel.ac.in/courses/106105152">https://nptel.ac.in/courses/106105152</a> Dr. Balaraman Ravindran.(2024).Introduction to Machine Learning, IIT Madras. <a href="https://nptel.ac.in/courses/106106139">https://nptel.ac.in/courses/106106139</a>
<b>Videos</b>	

### Course Articulation Matrix

<b>COs</b>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	2	1	1	2	2	-	-	-	-	2	-	-	2	2	3

## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Data Analytics
<b>Course Code</b>	MCA305 (P)

### Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	1	1	5
<b>Course Type</b>	Embedded theory and lab							
<b>Course Category</b>	Discipline Electives							
<b>Pre-Requisite/s</b>				<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<b>CO1-</b> To understand the fundamentals of Big Data.( <b>BL1-Remember</b> ) <b>CO2-</b> To know about the different tools for Big Data and Visualization.( <b>BL2-Understand</b> ) <b>CO3-</b> To explore tools and practices for big data and Visualization.( <b>BL3-Apply</b> ) <b>CO4-</b> To recognize the role of business intelligence and visualization in decision making.( <b>BL4-Analyze</b> ) <b>CO5-</b> To analyze data using Power BI, Tableau etc.( <b>BL5-Evaluate</b> ) <b>CO6-</b> To prepare design dashboard for presenting analytics from data.( <b>BL6-Create</b> )							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>					

## Part B

Modules	Contents	Pedagogy	Hours
1	Big Data: Fundamentals of Big Data, defining big data, building successful big data management architecture, big data journey Big Data Types: Structured and unstructured data types, real time and non-real time requirements. Distributed Computing: History of distributed computing, basics of distributed computing	lecturing	9
2	Visualization: data visualization, appropriate data visualization technique for given data, design visualizations, dashboard Operational Databases: Relational database, nonrelational database, key-value pair databases, document databases, columnar databases, graph databases, spatial databases MapReduce Fundamentals: Origin of MapReduce, map function, reduce function, putting map and reduce together, optimizing map reduce.	lecturing,Experiment	10
3	Data Aggregation and Group operations: Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation. Time Series Data Analytics: Date and Time Data Types and Tools, Time series Basics, date Ranges, Frequencies and Shifting, Time Zone Handling, Periods and Periods Arithmetic, Resampling and Frequency conversion, Moving Window Functions.	lecturing,Experiment	9
4	Hadoop: Discovering Hadoop, Hadoop distributed file system, Hadoop MapReduce, Hadoop file system, dataflow, Hadoop I/O, data integrity, compression, serialization, file-based data structure Chaining.	lecturing,Experiment	9
5	Introduction to Hadoop Ecosystem: Avro - Avro data types and schemas, in-memory serialization and deserialization, avro datafiles, schema resolution Pig-Comparison with databases, pig latin, user defined functions, data processing operators Hive-Running hive, comparison with traditional databases, HiveQL, tables, querying data, userdefined functions Spark: Resilient distributed datasets, shared variables, anatomy of a spark job run, executors and cluster managers, HBase: HBasics, concepts, clients, HBase vs RDBMS, Praxis ZooKeeper: ZooKeeper services, building application with ZooKeeper	PBL	8

### Part D(Marks Distribution)

#### Theory

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	

#### Practical

Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

### Part E

<b>Books</b>	Big Data Fundamentals: Concepts, Drivers & Techniques (The : Prentice Hall)
<b>Articles</b>	
<b>References Books</b>	Chris Eaton, Dirk Deroos et al. , “Understanding Big data”, McGraw-Hill.
<b>MOOC Courses</b>	
<b>Videos</b>	

### Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	1	1	-	-	-	-	-	-	-
CO2	-	-	1	1	1	1	-	-	-	1	1	1	-	-	-
CO3	-	-	1	-	1	-	1	-	1	1	1	-	-	-	-
CO4	1	1	1	1	1	1	-	-	-	-	-	1	-	1	-
CO5	-	-	-	-	1	1	1	1	-	1	-	1	-	1	-
CO6	1	-	-	-	1	-	1	-	1	-	1	1	-	1	-





## Syllabus-2023-2024

(SOET)(MCA)

<b>Title of the Course</b>	Dissertation / Industrial Training/
<b>Course Code</b>	MCA 401

### Part A

Year	2nd	Semester	4th	Credits	L	T	P	C
					0	0	20	20
<b>Course Type</b>	Project							
<b>Course Category</b>	Projects and Internship							
<b>Pre-Requisite/s</b>	software development life cycle, Project life cycle			<b>Co-Requisite/s</b>				
<b>Course Outcomes &amp; Bloom's Level</b>	<p><b>CO1- CO1</b> : Understand the project Development Life Cycle <b>(BL2-Understand)</b></p> <p><b>CO2- CO2</b> : Apply the core discipline knowledge and develop a complete system for the given / chosen task<b>(BL3-Apply)</b></p> <p><b>CO3- CO3</b> : Analyze the performance of the system developed using standard techniques for testing <b>(BL4-Analyze)</b></p> <p><b>CO4- CO4</b> : Evaluate the performance of the system developed against the performance of similar tools./ systems <b>(BL5-Evaluate)</b></p>							
<b>Courses Elements</b>	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗		<b>SDG (Goals)</b>	SDG4(Quality education) SDG8(Decent work and economic growth)				

### Part B

Modules	Contents	Pedagogy	Hours
Industrial Training Track	Option 1: The student will be subjected to a 4.5 months of Industrial Training at some IT Industry / Software Industry or IT support department in any industry. The student will work on real time software / IT support systems and gain insight into real time application development. At the end of training the student has to submit a finishing and relieving certificate issue b the organization where he/ she has taken up the training. the evaluation will be done on the basis of presentation and project report submitted by the student.	Industrial Training	20
Dissertation Track	Option 2: The studnet can take up dissertation work under the guidance of approved PG guides of the department on any upcoming technology / domain. During the dissertation work it is mandatory for the student to publish at least two research articles in any UGC CARE listed Journals (Preferably SCOPUS indexed )		
Submission of Report	On completion of the Industrial Training / Dissertation the student has to submit project report in three copies along with the certificate form the organization in case of Industrial Training and from guide and HoD in case of Dissertation work. The evaluation of the student will be done based on the project report submitted and presentation of the work done.		

### Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Develop Synopsis for the proposed / chosen topic	PBL	BL2-Understand	10
2	Develop prototype of the system proposed	PBL	BL3-Apply	30
3	Performa testing on the modules and the ysstme as a whole	Experiments	BL4-Analyze	10
4	incoporate the changes required based on testing result	PBL	BL3-Apply	10



