

**HINDUSTHAN
EDUCATIONAL AND**



HICET

***HINDUSTHAN
COLLEGE OF ENGINEERING AND TECHNOLOGY***

(An Autonomous Institution)

Coimbatore – 641032

DEPARTMENT OF COMPUTER APPLICATIONS

Revised Curriculum and Syllabus for the Batch

2022-2024 & 2023 – 2025 for ACM on 19.06.2023

2020 REGULATIONS



Hindusthan College of Engineering and Technology

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Valley Campus, Pollachi Highways, Coimbatore, Tamilnadu.



DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

POSTGRADUATE PROGRAMMES

MCA. COMPUTER APPLICATIONS (PG)

REGULATION-2020 (Revised on August 2022)

(For the students admitted during the academic year 2021-2022 and onwards)

SEMESTER I – BRIDGE COURSE

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21CA1291	PoP and OOPS	BRIDGE	3	0	0	-	100	0	100
2.	21CA1292	Fundamentals Of Web Designing	BRIDGE	3	0	0	-	100	0	100
PRACTICAL										
3.	21CA1091	PoP and OOPS LAB	BRIDGE	0	0	3	-	100	0	100
Total				6	0	3	0	300	0	300

SEMESTER I – REGULAR COURSE

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21CA1202	Computer Networks	PC	3	0	0	3	40	60	100
2.	21CA1203R	Java Programming	IC	3	1	0	4	40	60	100
3.	21CA1204	Database Management Systems	IC	3	0	0	3	40	60	100
4.	21CA1205	Probability and Statistics	FC	3	1	0	4	40	60	100
5.	21CA1251	UI Design and Development	PC	3	0	2	4	50	50	100
PRACTICAL										
6.	21CA1001R	Java Programming Lab	EEC	0	0	3	1.5	60	40	100
7.	21CA1002	DBMS Lab	EEC	0	0	3	1.5	60	40	100
8.	21CA1172	Soft Skill course through NPTEL*	EEC	0	0	2	2	100	---	100
Total				15	3	8	23	430	370	800

* Soft skill / Communication Skill / Technical Course approved by BoS

SEMESTER II – BRIDGE COURSE

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21CA2291	Software Engineering	BRIDGE	3	0	0	-	100	0	100
2.	21CA2292	Operating System	BRIDGE	3	0	0	-	100	0	100
PRACTICAL										
3.	21CA2091	Software Engineering Tools Lab	BRIDGE	0	0	3	-	100	0	100
Total				6	0	3	0	300	0	300

SEMESTER II – REGULAR COURSE

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21CA2201R	Data Structures and Algorithms	PC	3	1	0	4	40	60	100
2.	21CA2203R	Python Programming	PC	3	1	0	4	40	60	100
3.	21CA2251	Web Development (T +L)	PC	3	1	0	4	40	60	100
4.	21EC2251	Electronics for Embedded Systems(T+L)	IC	3	0	0	3	40	60	100
5.	21CA23XX	Professional Elective -I/ NPTEL / EDX	PE	3	0	0	3	40	60	100
6.	21CA2171	L/S/MOOC	EEC	2	0	0	2	100	---	100
PRACTICAL										
7.	21CA2001	Python Programming Lab	EEC	0	0	3	1.5	50	50	100
8.	21CA2002	Data Structures & Algorithms Lab	EEC	0	0	3	1.5	50	50	100
9.	21CA2801	Internship / Industrial Training	EEC	0	0	0	2	100	---	100
Total				17	3	6	25	500	400	900

SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1.	21CA3205	Cryptography and Network Security	IC	3	1	0	4	40	60	100
2.	21CA3206	Deep Learning Techniques	PC	3	1	0	4	40	60	100
3.	21CA3252	Data Visualization using Tableau	PC	3	0	2	4	50	50	100
4.	21EC3251	Internet of Things	PC	2	0	2	3	50	50	100
5.	21CA33XX	Professional Elective -I/ NPTEL / EDX	PE	3	0	0	3	40	60	100
6.	21CA3571	L/S/MOOC	EEC	2	0	0	2	100	---	100
PRACTICAL										
7.	21CA3001	Mini Project Lab	EEC	0	0	3	1.5	60	40	100
8.	21CA3003	Deep Learning Lab	EEC	0	0	3	1.5	60	40	100
Total				17	3	6	23	440	360	800

SEMESTER IV

S.No	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
THEORY										
1	21CA4901	Project Work	EEC	0	0	0	14	50	50	100
Total				0	0	0	14	50	50	100

LIST OF PROFESSIONAL ELECTIVES


S.No.	Course Code	Course Title	Category	L	T	P	C	CIA	ESE	TOTAL
PROFESSIONAL ELECTIVE I										
1	21CA2301	Cyber Security	PE	3	0	0	3	40	60	100
2	21CA2302	Green Computing	PE	3	0	0	3	40	60	100
3	21CA2303	Human Computer Interaction	PE	3	0	0	3	40	60	100
4	21CA2304	Professional Ethics	PE	3	0	0	3	40	60	100
5	21CA2305	Web Graphics	PE	3	0	0	3	40	60	100
6	21CA2306	Digital Logic and Computer Organization	PE	3	0	0	3	40	60	100
7	21CA2307	E-Learning Techniques	PE	3	0	0	3	40	60	100
8	21CA2308	Block Chain	PE	3	0	0	3	40	60	100
PROFESSIONAL ELECTIVE II										
1	21CA3301	Accounting and Financial Management	PE	3	0	0	3	40	60	100
2	21CA3303	Soft Computing Techniques	PE	3	0	0	3	40	60	100
3	21CA3305	E- Commerce	PE	3	0	0	3	40	60	100
4	21CA3306	Mixed Reality	PE	3	0	0	3	40	60	100
5	21CA3307	Organizational Behavior	PE	3	0	0	3	40	60	100
6	21CA3308	Research Methodology	PE	3	0	0	3	40	60	100
7	21CA3309	Semantic Web Services	PE	3	0	0	3	40	60	100
8	21CA3310	Fundamentals of Cloud Computing	PE	3	0	0	3	40	60	100

CREDIT DISTRIBUTION

Semester	I	II	III	IV	Total
Credits	23	25	23	14	85


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Chairman - BoS
MCA - HiCET




 Dean - Academics
Dean (Academics)
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DEPARTMENT OF COMPUTER APPLICATIONS

SYLLABUS REVISION DETAILS FOR THE REGULATION 20 – ACADEMIC YEAR 2023-24 ODD SEMESTER

S. NO	COURSE CODE/COURSE NAME	SUGGESTION BY EXPERTS	EXISTING CONTENT (IN THE AY 2022-23 ODD)	REVISED CONTENT (FOR AY 2023-24 ODD)	TYPE OF REVISION/ DELETION/ INSERTION/ MODIFICATION	PERCENT AGE OF REVISION
1			<p>UNIT I - INTRODUCTION, DATABASE DESIGN AND RELATIONAL MODEL Introduction-Database System Applications, Purpose of Database Systems, View of Data – Database Languages, Database and Application Architecture, Database Users and Administrators – Database Schema – Keys – Schema Diagrams - ER diagrams – Mapping Cardinalities – Alternatives Notations for Modeling Data – Data Flow Diagram.</p>	<p>UNIT I - INTRODUCTION Introduction-Database System Applications, Purpose of Database Systems, View of Data – Database Languages, Database Users and Administrators – Database Schema – Keys – Schema Diagrams - ER diagrams – Mapping Cardinalities – Data Flow Diagram.</p>	Title changed	5%
2	21CA1204 DATABASE MANAGEMENT SYSTEMS	Suggestions to rename the unit headings in DBMS.	<p>UNIT II - RELATIONAL ALGEBRA, INTRODUCTION TO SQL & INTERMEDIATE SQL Relational Algebra - Selection and Projection, Set operations, Renaming, Introduction to SQL – DDL – DML Commands – Basic Structure of SQL Queries – Set Operations – Null Values – Aggregate Functions – Nested Sub Queries – Intermediate SQL – Joins, Views and Transactions.</p> <p>ADVANCED SQL – FUNCTIONAL DEPENDENCY & NORMAL FORMS Advanced SQL – Exceptional Handling using PL/SQL – Triggers & Cursors –</p>	<p>UNIT II - SQL AND PL / SQL Introduction to SQL – DDL – DML Commands – Basic Structure of SQL Queries – Set Operations – Null Values – Aggregate Functions – Nested Sub Queries – Intermediate SQL – Joins, Views and Transactions</p> <p>UNIT III - DATABASE DESIGN Advanced SQL – Exceptional Handling using PL/SQL – Triggers & Cursors – Functions and Procedures – Subquery –</p>	Title changed and one four topics removed	10%
					Title changed	

DEPARTMENT OF COMPUTER APPLICATIONS

SYLLABUS REVISION DETAILS FOR THE REGULATION 20 – ACADEMIC YEAR 2023-24 ODD SEMESTER

		<p>Functions and Procedures – Subquery – Independent sub query - Correlated Sub Query- Functional Dependency - Reasoning about FDS-Relational Database design: features of good atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).</p> <p>TRANSACTION PROCESSING AND CONCURRENCY CONTROL Introduction- Transaction Concepts- Concurrency Control- Locking Methods for Concurrency Control- Timestamp Methods for concurrency control- Optimistic Methods for concurrency control.</p> <p>SPECIALITY DATABASES & NO SQL DATABASE Overview, Complex Data Types, ODBMS & ORDBMS, Structured Types and Inheritance in SQL, Table Inheritance, Object-Identity and Reference Types in SQL. Unstructured database – NOSQL an Overview</p>	<p>Independent sub query - Correlated Sub Query- Functional Dependency - Reasoning about FDS-Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).</p> <p>UNIT IV - TRANSACTION PROCESSING Introduction- Transaction Concepts- Concurrency Control- Locking Methods for Concurrency Control- Timestamp Methods for concurrency control- Optimistic Methods for concurrency control.</p> <p>UNIT V - OODBMS AND ORDBMS Overview, Complex Data Types, ODBMS & ORDBMS, Structured Types and Inheritance in SQL, Table Inheritance, Object-Identity and Reference Types in SQL. Unstructured database – NOSQL an Overview</p>	<p>Title changed</p>	
21CA1205 PROBABILITY AND STATISTICS	<p>Members suggested to enhance the portions of Probability Statistics instead of Operation Research</p>	<p>PROBABILITY AND RANDOM VARIABLE Definition – Axioms of Probability – Conditional Probability – Total Probability – Baye's Theorem (with out proof) – Random variable – Discrete and continuous random variables – Moment generating functions.</p>	<p>UNIT I - PROBABILITY AND RANDOM VARIABLE Random variable – Discrete and continuous random variables – Probability mass function – Probability density function – Cumulative distribution functions - Moment generating functions Introduction to R programming and Application of descriptive</p>	<p>Lab programs included</p>	10%

DEPARTMENT OF COMPUTER APPLICATIONS

SYLLABUS REVISION DETAILS FOR THE REGULATION 20 – ACADEMIC YEAR 2023-24 ODD SEMESTER

			<p>statistics – Mean, Median, Mode, variance and Box plot</p> <p>UNIT II - TWO DIMENSIONAL RANDOM VARIABLES Joint probability mass function - Joint probability density function – Marginal Probability mass function – Marginal probability density function - Conditional Probability mass function - Conditional Probability density function – Independent random variables. Application of Normal distribution.</p>	<p>Entire unit is changed – Probability topics and lab program are included</p>	20%
	<p>TRANSPORTATION AND ASSIGNMENT MODELS Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm.</p>		<p>UNIT III - CORRELATION AND REGRESSION Correlation – Karl Pearson's correlation coefficient – Spearman's Rank Correlation – Regression lines (problems based on Raw data only). R-Lab : Introduction to R programming, Correlation and Regression</p>	<p>Entire unit is changed – Probability topics and lab program are included</p>	20%
	<p>LINEAR PROGRAMMING MODELS Mathematical Formulation of LPP- Graphical method– Simplex method – Artificial variable Techniques- Sensitivity analysis.</p>		<p>UNIT IV - HYPOTHESIS TESTING Small sample test – t test for single mean and difference of mean - F distribution for variance, Chi – Square test for independence of attributes – Goodness of fit. Large sample test based on Normal distribution - test of significance for single mean and difference of means R-Lab : t -test, F test , Chi –</p>	<p>Lab programs included</p>	10%

DEPARTMENT OF COMPUTER APPLICATIONS

SYLLABUS REVISION DETAILS FOR THE REGULATION 20 – ACADEMIC YEAR 2023-24 ODD SEMESTER

<p>21CA1002 DBMS LABORATORY</p> <p>Suggested Case study format of questions can be given for DBMS lab</p>	<p>SCHEDULING BY PERT AND CPM Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling. Implement the Installation process of any database from scratch. Draw ER Diagram for an Application. Construct DFD for an Application.</p>	<p>SCHEDULE UNIT V - ANALYSIS OF VARIANCE Introduction, assumptions of analysis of variance, completely randomized design, randomized block design, Latin square design. R-Lab : Completely randomized design, randomized block design Implement the Installation process of Oracle database from scratch XYZ hospital is a multi-specialty hospital that includes a number of departments, rooms, doctors, nurses, compounders, and other staff working in the hospital. Patients having different kinds of ailments come to the hospital and get checked done from the concerned doctors. If required they are admitted in the hospital and discharged after treatment. Draw ER Diagram for the above scenario. Construct DFD for restaurant management system with details of sales, order, events, bills and employees Design a user management system that allows administrators to perform CRUD (Create, Read, Update, Delete) operations on user accounts and manage user permissions using DDL, DML, DCL, and TCL statements. SQL Functions - Create a database schema that includes tables such as sales, products,</p>	<p>Entire unit is changed – Probability topics and lab program are included Domain specific questions are given Domain specific questions are given Domain specific questions are given</p>	<p>20% 80 %</p>
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	<p>customers, and orders to store relevant information.</p> <p>i. Combine data from multiple tables and retrieve relevant information for analysis.</p> <p>Filter data based on specific conditions and perform aggregations on subsets of data.</p>	<p>questions are given</p>																					
<p>Queries</p>	<p>Consider a data base table consists of student details. Management also wants to add marks scored by student for all the subjects.</p>	<p>Domain specific questions are given</p>																					
	<table border="1"> <thead> <tr> <th>Register No</th> <th>Name</th> <th>Department</th> </tr> </thead> <tbody> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> </tr> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> </tr> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> </tr> </tbody> </table>	Register No	Name	Department	101001	Ravi	CSE	101001	Ravi	CSE	101001	Ravi	CSE	101001	Arul	CSE	101001	Arul	CSE	101001	Arul	CSE	<p>Questions:</p> <p>i. Eliminate the redundancy from the above table.</p> <p>Eliminate Data manipulation anomalies and Data inconsistency from the above table.</p>
Register No	Name	Department																					
101001	Ravi	CSE																					
101001	Ravi	CSE																					
101001	Ravi	CSE																					
101001	Arul	CSE																					
101001	Arul	CSE																					
101001	Arul	CSE																					

DEPARTMENT OF COMPUTER APPLICATIONS

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	<p>Develop an inventory management system for a retail company. The system tracks inventory levels, handles stock updates, and generates reports. Design and implement functions and triggers in PL/SQL to enhance the functionality of the system.</p> <p>Utilize functions and triggers in PL/SQL to automate stock updates and generate inventory reports in an inventory management system.</p>	<p>Exercise using NoSQL Database</p> <p>Students shall develop creative or innovative project.</p> <p>Need to submit a report, presentation with demo.</p>	<p>Write a PL/SQL program for an application using Functions.</p> <p>Write a PL/SQL block for transaction operations of a typical application using Triggers</p>	<p>Exercise using NoSQL Database</p> <p>Students shall develop creative or innovative project.</p> <p>Need to submit a report, presentation with demo.</p> <p>User Based Testing and feedback from the benefited society required.</p>	<p>Domain specific questions are given</p>
	<p>Exercise using NoSQL Database</p> <p>Students shall develop creative or innovative project.</p> <p>Need to submit a report, presentation with demo.</p> <p>User Based Testing and feedback from the benefited society required.</p> <p>Students can select topics from either one of the following domain</p> <ul style="list-style-type: none"> • Application based or • Algorithms-based projects • Data Analysis Projects • Simulation Projects • Optimization Projects • Automation Projects • Web Development Projects <p>Mobile App Development Projects</p>	<p>Exercise using NoSQL Database</p> <p>Students shall develop creative or innovative project.</p> <p>Need to submit a report, presentation with demo.</p> <p>User Based Testing and feedback from the benefited society required.</p>	<p>suggested to include Domain name in Mini Project instead of simple descriptions.</p>	<p>21CA3001 MINI PROJECT</p>	<p>Domain specific questions are given</p>



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III SEMESTER – NEW COURSES

<u>R 2020</u>	
COURSE CODE	COURSE NAME
21CA3206	DEEP LEARNING TECHNIQUES
21CA3252	DATA VISUALIZATION USING TABLEAU
21CA3003	DEEP LEARNING LAB

Chairman

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SEMESTER I- BRIDGE COURSE
ODD SEM

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1291	PoP and OOPS	3	0	0	-
Unit	Description	Instructional hours				
I	Introduction in C- Process of programming – Variables- Operators – Loops- Break statement – Continue Statement- Data Types in C – ASCII Code - Operators Expressions Associatively - Precedence of operators - Expression evaluation – Functions	9				
II	Arrays in C -Pointers in C -Programming using arrays and pointers -Sizeof operator - Returning pointers from functions – Recursion -Multidimensional Arrays and Pointers- Structures in C -Singly Linked Lists - Doubly Linked Lists- File Handling	9				
III	Evolution of OOP Languages – Why OOPS –Characteristics of OOPS - Introduction to C++ - Programs with IO and Loop - Arrays and Strings- Function Overloading - Operator Overloading - Dynamic Memory Management	9				
IV	Classes and Objects -Access Specifiers - Constructors, Destructors and Object Lifetime - Copy Constructor and Copy Assignment Operator- Constants - Static Members - friend Function and friend Class	9				
V	Overloading Operator for User Defined Types-Namespace -Inheritance -Virtual Function Table - Type casting and cast operators -Multiple Inheritance – Exceptions – Template -Closing Comments	9				
Total Instructional hours						45

REFERENCES:

R1. https://onlinecourses.nptel.ac.in/noc19_cs42/preview


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MCA - HiCET





Dean - Academics
Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1292	FUNDAMENTALS OF WEB DESIGNING	3	0	0	-

Unit	Description	Instructional hours
	INTRODUCTION TO WWW	
I	Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.	9
	UI DESIGN	
II	Markup Language (HTML): Introduction to HTML and HTML5 - Formatting and Fonts - Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists	9
	CASCADING STYLE SHEET (CSS)	
III	The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets	9
	CASCADING STYLE SHEET (CSS)	
IV	Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS.	9
	SCRIPTING LANGUAGES	
V	HTML – forms – frames – tables – web page design - JavaScript introduction – control structures – functions – arrays – objects – simple web applications.	9
Total Instructional Hours		45

REFERENCE BOOKS:

- R1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", Fifth Edition, Pearson Education, 2011.
R2. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition Tata McGraw-Hill 2010.
R3. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
R4. Margaret Levine Young, "Internet and WWW", 2nd Edition, Tata McGraw Hill, 2002.
R5. Jeff Rule, Dynamic HTML: The HTML Developer's Guide, Addison-Wesley, 1999.



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MCA - HiCET




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Dean (Academics)
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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1091	PoP and OOPS LAB	0	0	3	-

S.no	Description of the experiments	practical hours
1.	Write a C program to check whether a number is even or odd	6
2.	Write a C Program to Check Leap Year	6
3.	Write a C Program to Find Factorial of a Number	3
4.	Write a program to search a given element in array using linear search.	6
5.	To find the smallest and largest element from a given array.	3
6.	To Sort n numbers using bubble sort using function sub program.	3
	Write a C++ program to perform String Concatenation	
	• using Arrays	
7.	• Using Functions	3
	• Using Arrays & functions	
	• Using Pointers & Functions	
8.	Write a C++ Program to illustrate the use of Constructors and Destructors and Constructor Overloading.	6
9.	Write a program to Illustrate Friend Function and Friend Class.	3
10.	Write C++ Programs and incorporating various forms of Inheritance.	3
11.	Write a C++ Program to illustrate Virtual functions	3
Total Instructional hours		45


 Chairman - BoS
Chairman - BoS
MCA - HiCET




 Dean - Academics
Dean (Academics)
HiCET

SEMESTER I – REGULAR COURSES

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1202	COMPUTER NETWORKS	3	0	0	3

COURSE OBJECTIVE

- 1.To understand networking concepts and basic communication model
- 2.To analyze the function and design strategy of physical, data link, network layer and transport layer
- 3.To acquire basic knowledge of various application protocol for internet security issues and services applied in presentation Layer.
4. To learn the Transport layer protocols TCP & UDP and Congestion principles.
5. To understand the Network Security concepts applied in Presentation layer

Unit	Description	Instructional Hours
FUNDAMENTALS		
I	Uses of Networks – Categories of Networks –Communication model –Data transmission concepts and terminology – Protocols – OSI– LAN Topology - Transmission media.	9
DATA LINK LAYER		
II	Functions of Data link Layer - Flow Control Protocols – Error Detection – Parity check, Checksum & CRC - Error Correction - Hamming Code - Ethernet, Token ring, Wireless LAN.	9
NETWORK LAYER		
III	Switching concepts – Circuit switching – Packet switching –IPV4, IPV6 –IP address Hierarchy – ICMP – Routing Protocols – Distance Vector – Link State.	9
TRANSPORT LAYER		
IV	Functions of Transport Layer -, Connection Establishment, Connection Release, Flow Control – Sliding Window protocol, UDP, TCP, Congestion control and Avoidance.	9
REAL TIME APPLICATIONS& NETWORK SECURITY		
V	DHCP – LDAP – HTTP – HTTPS – Packet Tracer – Cryptography – Ciphers – RSA algorithm – Web Security & Threats.	9
Total Instructional Hours		45

COURSE OUTCOME

CO1: Able to Understand the terminologies of Networks and Layers in a Network.
CO2: Able to understand the working principles of Data Link Layer, its functions and Network technology applied in LAN.
CO3: Able to understand the functionalities of Network Layer, IP addressing Mechanism and Routing Protocols.
CO4: Able to learn the Transport layer protocols TCP & UDP and Congestion principles.
CO5: Able to understand the Network Security concepts applied in Presentation layer.

REFERENCE BOOKS:

- R1 - Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Fourth Edition, Harcourt Asia / Morgan Kaufmann, 2009
- R2 - William Stallings, "Data and Computer Communications", Ninth Edition, Prentice Hall , 2011.
- R3 – Behrouz A. Forouzan, Data Communication and Networking, 5th Edition, Tata McGraw Hill, 2014
- R4 - Andrew S.Tannenbaum David J. Wetherall, "Computer Networks" Fifth Edition , Pearson Education 2011
- R5 - James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition,2012


Chairman – BoS

**Chairman - BoS
MCA - HiCET**




Dean - Academics

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HiCET**

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1203R	JAVA PROGRAMMING	3	1	0	4


- Course Objective
1. To impart the fundamental concepts of core JAVA.
 2. To explain the concepts of Multithreading
 3. To explore the skills in program development using Exception handling and I/O programming
 4. To gain the built-in knowledge of standalone and web applications.
 5. To understand the concepts needed for database connectivity.

Unit	Description	Instructional Hours
	INTRODUCTION	
I	Introduction –JDK Installation and Path Specification - Java Application Structure - Data types – Variables – Arrays –Operators - Control Structures– Class – Objects – Methods – Overloading Methods - Constructors – “This” keyword - Garbage Collection	12
	OOPS	
II	Nested classes – Inheritance – Using super keyword - Access specifier- Encapsulation- Interface-Polymorphism– Multi Level hierarchy – Method Overriding - Dynamic Method Dispatch – The Object class – Abstract classes -Package	12
	EXCEPTION HANDLING & THREADS	
III	Exception handling – Using try catch – Nested try- throw – throws – finally – Built in exceptions – user defined exceptions - Threads – Thread model – Creating a thread – Thread priorities – Synchronization – Multithreading – String Handling – Tokenizer - Wrappers	12
	AWT, FRAMES AND APPLETS	
IV	AWT controls - Frames – Applet structure – HTML Applet Tag – Event Handling -Event Listeners - Applet Programming	12
	FILES & DATABASES	
V	Networking – RMI- I/O streams – Reading/Writing console – Files - Manipulating Databases with JDBC – Java Collections	12
Total Instructional Hours		60

- Course Outcome
- CO1: Create applications using classes and objects
CO2: Design new applications by applying reusability and Packages concept
CO3: Apply Multithreading concepts to execute parallelism Exception handling.
CO4: Solve programs using Frames, Event handlers and Applets
CO5: Compute rich applications using I/O, Files, JDBC and System/Utility classes

REFERENCE BOOKS:

- R1- Herbert Schildt, “JAVA - The Complete Reference”, Ninth Edition 2014, McGraw-Hill Education,
R2- RashmiKanta Das, “Core Java for Beginners”, Third Edition, First Reprint 2015, Vikas Publishing House Pvt Ltd, ISBN – 978-93259-6850-9.
R3-Deitel, Deitel,” Java How to Program”, Tenth Edition, PHI, 2015


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1204	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

COURSE OBJECTIVE

1. To remember the fundamentals of Database Management Systems and Relational Model.
2. To understand the concepts of Relational Algebra and SQL queries.
3. To make the students to understand the Schemas and Normalization.
4. To understand Transaction Management and Concurrency Control.
5. To understand ODBMS, ORDBMS and No SQL databases.

Unit	Description	Instructional hours
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INTRODUCTION

I	Introduction-Database System Applications, Purpose of Database Systems, View of Data – Database Languages, Database and Application Architecture, Database Users and Administrators – Database Schema – Keys – Schema Diagrams - ER diagrams – Mapping Cardinalities – Data Flow Diagram.	9
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SQL AND PL / SQL

II	Introduction to SQL – DDL – DML Commands – Basic Structure of SQL Queries – Set Operations – Null Values – Aggregate Functions – Nested Sub Queries – Intermediate SQL – Joins, Views and Transactions.	9
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DATABASE DESIGN

III	Advanced SQL – Exceptional Handling using PL/SQL – Triggers & Cursors – Functions and Procedures – Subquery – Independent sub query - Correlated Sub Query- Functional Dependency - Reasoning about FDS-Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).	9
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TRANSACTION PROCESSING

IV	Introduction- Transaction Concepts- Concurrency Control- Locking Methods for Concurrency Control- Timestamp Methods for concurrency control- Optimistic Methods for concurrency control.	9
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OODBMS AND ORDBMS

V	Overview, Complex Data Types, ODBMS & ORDBMS, Structured Types and Inheritance in SQL, Table Inheritance, Object-Identity and Reference Types in SQL. Unstructured database – NOSQL an Overview	9
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Total Instructional hours 45

COURSE OUTCOME

- CO1: To remember the database fundamentals, database design and relational model.
 CO2: To identify various methods in Relational Algebra and to write various SQL statements.
 CO3: To understand Advanced SQL concepts, Functional Dependencies and various normal forms to be used in the database tables.
 CO4: To manage transactions in the tables and to control the concurrency of data in the databases.
 CO5: To be familiar with Specialty and NoSql Database.

REFERENCE BOOKS

- R1. Abraham Silberschatz, H.F. Korth, S.Sudarshan -Data base System Concepts- McGraw Hill, VII edition, 2020. (Unit 1)
 R2. Raghurama Krishnan, Johannes Gehrke-Data base Management Systems- McGraw-Hill Education, 3rd Edition, 2003.(Units 1,2,3)
 R3. Shio Kumar Singh, Database Systems- Concepts, Designs and Application-Pearson Education, Second Edition, 2013. (Units 4,5).


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1205	PROBABILITY AND STATISTICS	3	1	0	4

- COURSE OBJECTIVE**
1. Construct a well-defined knowledge of random variables.
 2. Explain the concept of two-dimensional random variables and determine covariance.
 3. Introduce Correlation concepts to understand the relation between two random variables.
 4. Describe some basic concepts of statistical methods for testing the hypothesis.
 5. Analyze the design of experiment techniques to solve various engineering problems.

Unit	Description	Instructional Hours
I	PROBABILITY AND RANDOM VARIABLE Random variable –Discrete and continuous random variables – Probability mass function - Probability density function – Cumulative distribution functions - Moment generating functions	12
II	Introduction to R programming and Application of descriptive statistics – Mean, Median, Mode, variance and Box plot TWO DIMENSIONAL RANDOM VARIABLES Joint probability mass function - Joint probability density function – Marginal Probability mass function – Marginal probability density function - Conditional Probability mass function - Conditional Probability density function – Independent random variables. Application of Normal distribution.	12
III	CORRELATION AND REGRESSION Correlation – Karl Pearson’s correlation coefficient – Spearman’s Rank Correlation – Regression lines (problems based on Raw data only). R-Lab : Introduction to R programming, Correlation and Regression	12
IV	HYPOTHESIS TESTING Small sample test – t test for single mean and difference of mean - F distribution for variance, Chi – Square test for independence of attributes – Goodness of fit. Large sample test based on Normal distribution - test of significance for single mean and difference of means R-Lab : t -test, F test , Chi – square test.	12
V	ANALYSIS OF VARIANCE Introduction, assumptions of analysis of variance, completely randomized design, randomized block design, Latin square design. R-Lab : Completely randomized design, randomized block design	12
Total Instructional Hours		60

- COURSE OUTCOME**
- CO1: Understand the concepts of random variables.
CO2: Express the phenomenon of two-dimensional random variables.
CO3: Compute correlation and predict unknown values using regression.
CO4: Understand the concepts of statistical methods for testing the hypothesis.
CO5: Apply Design of Experiment techniques to solve various engineering problems.

TEXT BOOKS:

- T1 – Saeed Ghahramani, “Fundamentals of probability with stochastic processes”, Prentice Hall New Jersey, 2016.
T2 - Medhi J,” stochastic Processes”, New Age International Publishers,New Delhi,2014.

REFERENCE BOOKS :

- R1- O.C. Ibe, “Fundamentals of Applied Probability and Random Processes”, Elsevier, First Indian Reprint, 2010.
R2 - Applied statistics and Probability for Engineers by C.MontGomery ,6thEdition,Wiley Publications.
R3 - Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1251	UI DESIGN AND DEVELOPMENT	3	0	2	4


COURSE OBJECTIVE	
	<ol style="list-style-type: none"> To understand the concepts and architecture of the World Wide Web. To understand and practice mark-up languages. To understand and practice embedded dynamic scripting on client-side Internet Programming. To understand and practice web development techniques on client-side. To understand and develop design rich client presentation using PHP

Unit	Description	Instructional Hours
I	INTRODUCTION Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP Request – Response. Introduction HTML – HTML Elements – Semantics – Attributes –Headings-Paragraph-Styles – Formatting – Quotations – Computer Code- Comments & Colors- HTML CSS– Links & Images –Lists-Classes-Layout.	8
	Illustrative Problem: Develop a web page which includes various text formatting commands, Unordered list, ordered list, Table, simple form, hyper link, insert an image to Web page, insert scrolling text using Marquee tag, divide a page into Frames, simple layout of Webpage.	4
II	UI DESIGN HTML5 - Style Guide and Coding Convention – Html Svg and Canvas – Html API’s - Audio & Video - Drag/Drop - Local Storage - Web Socket API– Debugging and Validating Html.	
	Cascading Style Sheet (CSS3): The Need for CSS – Basic Syntax and Structure - How to add CSS :Inline Styles – Embedding Style Sheets - Linking External Style Sheets - Introduction to CSS3 – Backgrounds - Manipulating text - Margins and Padding - Positioning Using CSS -Responsive Web Design.	8
III	Illustrative Problem: Develop a Tribute page by Make webpage writing about that person adding his/her image. On the top of the webpage, add the image and name of the person and below that give layout for the rest of the details. You can use paragraphs, lists, links, images with CSS to give it a descent look. Add a suitable background color and font style on your webpage. Most of the parts you can make using HTML but to give it a better look using a bit of CSS. Take help from the link given below.	4
	OVERVIEW OF JAVASCRIPT Introduction - Objects- Scope – Data Types and Variables - Array, Date and Math Related Objects - Operators, Expressions, and Conditions, loop Statements – Type Conversion – Java Script Forms – Form Validations - Java Script HTML Document Object Model.	8
IV	Illustrative Problem: Develop a random quote generator app that displays random famous quotes every time a button is pressed in this project. A quote from a prominent athlete, politician, or historical figure can be displayed.	4
	JAVASCRIPT ERROR HANDLING AND JQUERY JavaScript Errors – Debugging – JavaScript Functions. Introduction to jQuery –Syntax – Selectors –Events – Traversing – AJAX.	8
V	Illustrative Problem: Implement the project using AJAX and Jscript to create normal drop down box from which selecting an item will display its detail and information.	4
	PHP Introduction –Using Arrays – String Manipulations – Object Oriented PHP: Object Oriented Concepts – Creating Classes, Attributes, Operations in PHP – Implementing Inheritance in PHP. Creating Web Database: Creating database and users – Setting up user for web – Creating database Tables Inserting, retrieving and updating data into database – Altering tables. Accessing MySQL from web with PHP	
	Illustrative Problem: Implement a Login System with PHP and My SQL. Implement an interactive web application for online shopping with PHP.	
	Total Instructional Hours	60

Course Outcome CO1: Able to Understand the basics of world wide web
CO2: Able to Create website using HTML and Cascading Style Sheets.
CO3: Able to design and implement dynamic web page with validation using JavaScript Objects
CO4: Able to design rich client presentation using AJAX.
CO5: Able to Design and implement simple web page in PHP.

REFERENCE BOOKS :

- R1. David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011
- R2. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, "Internet and World Wide Web - How to Program", Fifth Edition, Pearson Education, 2011
- R3. James Lee, Brent Ware, "Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl, and PHP" Addison Wesley, Pearson 2009
- R4. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, 2010
- R5. Thomas A Powell, Fritz Schneider, "JavaScript: The Complete Reference", Third Edition, Tata McGraw Hill, 2013.
- R6. Thomas A Powell, "Ajax: The Complete Reference", McGraw Hill, 2008


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1001R	JAVA PROGRAMMING LAB	0	0	3	1.5
COURSE OBJECTIVE	1. To apply the object concepts, array of objects, control structure and constructor in Javaprograms. 2. To build programs to learn inheritances, interface, packages, applets and graphics 3. To construct programs to use exceptions and handle various events. 4. To develop programs to apply i/o concepts, multithreading and access database from GUI. 5. To implement applets in real world applications.					

Unit	Description	Instructional hours
	OBJECT, ARRAYS, CONTROL STRUCTURE AND CONSTRUCTOR	
1	a. Write a program to calculate employee payroll using arrays and structures. Create 2 classes to perform payroll calculation and for input and output display. Based on basic pay create array to calculate HRA, DA, MA, PF and net pay. b. Write a program for complex number operation using constructors.	3
	INHERITANCE	
2	Give an array of size N which contains the marks of a student in N subjects, the task is to calculate the CGPA of the student. Write a program for marksheet preparation using 3 classes to get, calculate and display mark statement using inheritance. Note: Consider all marks to be out of 100 for each subject.	3
	INTERFACE AND PACKAGE	
3	a. Create an interface for declaring variables and methods and create two classes for performing calculation and execution to find voter eligibility. b. Create a package for flat water maintenance bill, import the package in a class file to get input and display the final detailed bill. Note: Calculate water bill based on water consumption as given below: Rate (Rs/m ³), Charges (Rs) Usage (m ³), for 0 - 20 m ³ -> Rs.0.50/-, for 21 - 35 m ³ ->Rs.0.90/-, for > 35 m ³ ->Rs.1.30/-	3
	OVERLOADING, OVER-RIDING AND MULTITHREADING	
4	a. Write a program to calculate the area of square, rectangle and triangle. Create a method area, perform method over riding and overloading using the method area. b. Write a program to display 16 times tables up to 16 using multithreading	3
	USER-DEFINED AND PRE-DEFINED EXCEPTION HANDLER	
5	a. A company consists of 1000 employees over 50 years. Each employee is assigned with unique id number up to 1000. Write a program to check the details of the employee using employee id. Generate user-defined exception handler if the employee id is not in the database. b. Create build-in exceptions using try and catch block. Arise exception in try block and handle the build-in exception in catch block. Execute the exception code in separate class to check arithmetic exception, array index out of bound exception, negative array size exception and number format exception.	6
	STRING CLASS AND STRING TOKENIZER	
6	a. Get strings as input. Use switch statements to select the string functions like insert, append, delete, concatenate, find and replace. Read input and perform the actions using string buffer functions. b. Get multiple statements as string input. Use full stop as String tokenizer. Using while loop count the tokens and display the string in separate line by sorting the string.	6
	FILES AND STREAMS	
7	Assign a variable to receive the units of electricity consumed, the task is to calculate the electricity bill using Files and streams, provided 1 to 100 units – Rs.10/unit, 100 to 200 units – Rs.15/unit, 200 to 300 units – Rs.20/unit and above 300 units – Rs.25/unit.	3

VECTOR AND WRAPPER CLASS

- 8 A cone shaped tank is used to store water with 9 feet height and 14 feet diameter. Calculate the volume using vector and wrapper class by providing input values during run time, round off the values if needed and use $\pi=3.14$. Formula to calculate volume is $v=1/3*\pi*r^2*h$ 3

NETWORKING OPERATION

- 9 Create a client port, server port, buffer size and datagram socket. Connect both ports in two different command prompts and interchange text message between both the ports 3

AWT CONTROLS

- 10 Use applet viewer to get personal details using text box for receiving name, check box group for gender details, text box with scroll bar for address details, List for qualification details, Choice option for country details and button to submit details. Using ActionListener() add the details and print the details. 3

APPLET & FRAMES

- 11 a. Create a class mouse extend applet implementing MouseListener, MouseMotionListener. Override both methods using action commands performed by mouse events and print the mouse events like mouse pressed, released, clicked, dragged, moved, entered and exited. 6
b. Create a class KeyEvent extend Applet implementing KeyListener. Override both method using action commands performed by key events and print keyboard events like pressed, released and typed.
c. Create class using frame concept implementing WindowListener() and MouseListener()

DATABASE

- 12 Create an Oracle or MySQL or SQL Server database that gets inserted, updated and deleted of a person's Aadhaar records when it is invoked in a GUI form to do so. 3

Total Instructional hours 45

CO1: Create object for the class and to input the values during run time.

CO2: Write programs in inheritance and achieve reusability. Moreover, to implement interface, package, applet and graphics

CO3: Develop programs to understand built in exception and custom exception.

CO4: Construct programs in I/O Stream classes and threads, as well to connect databases.

CO5: Extend client with server programs using network operations.

COURSE
OUTCOME


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA1002	DBMS LABORATORY	0	0	3	1.5

- COURSE OBJECTIVE**
- To give a better insight about ER and DFD.
 - To develop conceptual understanding of database management system
 - To understand how a real-world problem can be mapped to schemas
 - To develop understanding of different applications and constructs of SQL, PL/SQL.
 - To introduce the concepts of transactions and transaction processing

S.no	Description of the experiments	practical hours																																																								
1.	Implement the Installation process of Oracle database from scratch.	3																																																								
2.	XYZ hospital is a multi-specialty hospital that includes a number of departments, rooms, doctors, nurses, compounders, and other staff working in the hospital. Patients having different kinds of ailments come to the hospital and get checkup done from the concerned doctors. If required they are admitted in the hospital and discharged after treatment. Draw ER Diagram for the above scenario.	6																																																								
3.	Construct DFD for restaurant management system with details of sales, order, events, bills and employees	6																																																								
4.	Design a user management system that allows administrators to perform CRUD (Create, Read, Update, Delete) operations on user accounts and manage user permissions using DDL, DML, DCL, and TCL statements.	3																																																								
5.	SQL Functions - Create a database schema that includes tables such as sales, products, customers, and orders to store relevant information. <ol style="list-style-type: none"> Combine data from multiple tables and retrieve relevant information for analysis. Filter data based on specific conditions and perform aggregations on subsets of data. Consider a data base table consists of student details. Management also wants to add marks scored by student for all the subjects.	3																																																								
6.	<table border="1"> <thead> <tr> <th>Register No</th> <th>Name</th> <th>Department</th> <th>Semester</th> <th>Subject_code</th> <th>Subject_title</th> <th>Marks</th> <th>Grade</th> </tr> </thead> <tbody> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> <td>5</td> <td>CS2304</td> <td>System Software</td> <td>78</td> <td>C</td> </tr> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> <td>5</td> <td>CS2301</td> <td>Software Engineering</td> <td>99</td> <td>A</td> </tr> <tr> <td>101001</td> <td>Ravi</td> <td>CSE</td> <td>5</td> <td>CS2302</td> <td>Computer Networks</td> <td>88</td> <td>B</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> <td>5</td> <td>CS2304</td> <td>System Software</td> <td>98</td> <td>A</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> <td>5</td> <td>CS2301</td> <td>Software Engineering</td> <td>96</td> <td>A</td> </tr> <tr> <td>101001</td> <td>Arul</td> <td>CSE</td> <td>5</td> <td>CS2302</td> <td>Computer Networks</td> <td>87</td> <td>B</td> </tr> </tbody> </table>	Register No	Name	Department	Semester	Subject_code	Subject_title	Marks	Grade	101001	Ravi	CSE	5	CS2304	System Software	78	C	101001	Ravi	CSE	5	CS2301	Software Engineering	99	A	101001	Ravi	CSE	5	CS2302	Computer Networks	88	B	101001	Arul	CSE	5	CS2304	System Software	98	A	101001	Arul	CSE	5	CS2301	Software Engineering	96	A	101001	Arul	CSE	5	CS2302	Computer Networks	87	B	6
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7.	Questions: <ol style="list-style-type: none"> Eliminate the redundancy from the above table. Eliminate Data manipulation anomalies and Data inconsistency from the above table. Develop an inventory management system for a retail company. The system tracks inventory levels, handles stock updates, and generates reports. Design and implement functions and triggers in PL/SQL to enhance the functionality of the system.	3																																																								
8.	Exercise using NoSQL Database	3																																																								
Total Instructional hours		45																																																								

COURSE OUTCOME

- CO1: Able to Construct ER and DFD Diagram
- CO2: Ability to formulate SQL queries and PL/SQL based on the problems given
- CO3: Ability to Implements Joins and Sub queries
- CO4: Ability to Normalize the database.
- CO5: Ability to Practice Block chain Ethereum.


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SEMESTER -III

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3205	CRYPTOGRAPHY AND NETWORK SECURITY	3	1	0	4
COURSE OBJECTIVE	1. To understand Cryptography Theories, Algorithms and Systems.					
	2. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.					
	3. Understand the fundamental principles of access control models and techniques, Have a strong understanding of different cryptographic protocols and techniques					
	4. Authentication and secure system design and apply methods for authentication, access control, intrusion detection and be able to use them.					
	5. Identify and mitigate software security vulnerabilities in existing systems prevention.					

Unit	Description	Instructional Hours
INTRODUCTION		
I	Unit-1: Introduction - Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography – Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.	12
SYMMETRIC ENCRYPTION AND MESSAGE CONFIDENTIALITY		
II	Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.	12
AUTHENTICATION APPLICATIONS		
III	Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.	12
IP SECURITY		
IV	IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3.	12
INTRUDERS		
V	Intruders, Intrusion Detection, Password Management. Malicious Software: Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.	12
Total Instructional Hours		60

COURSE OUTCOME	CO1: Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
	CO2: Apply the different cryptographic operations of symmetric cryptographic algorithms
	CO3: Apply the different cryptographic operations of public key cryptography
	CO4: Apply the various Authentication schemes to simulate different applications.
	CO5: Understand various Security practices and System security standards.

REFERENCE BOOKS:

- R1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.
- R2. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
- R3. Behrouz A. Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007
- R4. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2
- R5. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007, Reprint 2015.
- R6. Stallings William, "Cryptography and Network Security - Principles and Practice 2017.
- R7. William Stallings, "Network Security Essentials Applications and Standards", Third Edition, Pearson Education, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3206	DEEP LEARNING TECHNIQUES	3	1	0	4


- COURSE OBJECTIVE**
1. Aims to equip students with a strong foundation in deep learning principles and techniques
 2. Develop and Train Neural Networks
 3. Develop and train CNN models for object detection, image segmentation, and image processing problems.
 4. Explore RNN architectures, evaluate performance, and gain practical insights for real-world applications.
 5. Gain foundation on GAN, generative AI and Reinforcement Learning.

Unit	Description	Instructional Hours
	BASICS	
I	Deep Learning – History - Key facts – Biological Neuron- Artificial Neuron – Mc Culloch Pitts Neuron, Limitations of MP Neuron – Perceptron – Multi-Layer Perceptron – Basics of Neural Networks: Neurons, Output Functions – Activation Functions – Weights and Biases	12
	NEURAL NETWORKS	
II	Forward Propagation – Backward Propagation- Gradient Descent, GRADIENT DESCENT Optimization – Vectorization – Frameworks: Tensor Flow, Open CV and Keras –Structure of Neural Networks	12
	CONVOLUTION NEURAL NETWORK	
III	Convolution Layer – Convolution Operations – Understanding CNN architecture - Building blocks of CNN - Transfer Learning – Object Detection and Segmentation with CNN	12
	RECURRENT NEURAL NETWORKS	
IV	Introduction to RNN – Types of RNN - Long Short-Term Memory - Gated Recurrent Units – Encoders – Decoders – Transformers – Sentiment Analysis using BERT	12
	DRIVING INNOVATIONS	
V	GAN, Architecture of GAN, Generative AI, Language Models, Types of Language Models - Reinforcement Learning – Elements of Reinforcement Learning	12
Total Instructional Hours		60

- COURSE OUTCOME**
- CO1: Understanding the basic principles of Deep Learning
CO2: Develop a Neural Network for a given application.
CO3: Developing and training CNN models in Computer vision.
CO4: Implement applications using Recurrent Neural network.
CO5: Understanding the concepts of GAN, generative AI and Reinforcement Learning

REFERENCES:

- R1. Ian Good fellow, YoshuaBengio, and Aaron Courville, "Deep Learning", MIT Press, 2016.
- R2. Francois Chollet, Manning , "Deep Learning with Python", Publications,2017.
- R3. RajalingappaaShanmugamani, Packt Publishing, "Deep Learning for Computer Vision", 2020
- R4. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", O'Reilly Media,2019.
- R5. PalashGoyal, Sumit Pandey, and Karan Jain, Apress, "Deep Learning for Natural Language Processing", 2018.
- R6. Andrew GlassnerPublisher, A K Peters, "Deep Learning: A Visual Approach", CRC Press, 2021
- R7. Mohamed Elgendy and Sridhar Alla "Deep Learning for Vision Systems", Packt Publishing Year of Publishing: 2021


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3252	DATA VISUALIZATION USING TABLEAU	3	0	2	4

- COURSE OBJECTIVE**
1. Comprehend the architecture and interface of Tableau, including workspace control and navigation.
 2. Demonstrate proficiency in extracting data from various sources, such as text files, Excel, and databases, and editing metadata.
 3. Analyze and blend data from multiple sources, sort and replace data sources in Tableau for effective visualization.
 4. Evaluate different data terminology and types, including data aggregation and file types, for appropriate visualization techniques.
 5. Analyze calculations in Tableau, including operators, functions, numeric, string, date, and table calculations, to derive meaningful insights.

Unit	Description	Instructional Hours
I	Introduction :Basics of Data Visualization- Data Visualization Tools - History - Advantage & Disadvantage - Tools - Architecture . Installation Download & Installation - Using workspace control - Desktop Workspace - Tableau Navigation - Data Terminology - Types - Data Aggregation - File Types <i>Program</i>	10
	1. <i>Introduction to Tableau and Aggregation Methods in Tableau</i>	2
II	Data Connectivity Data Sources - Text File - Microsoft Excel- Extracting Data - Editing Metadata - Data Joining - Data Blending - Data Sorting - Replacing Data Source. <i>Program</i>	6
	2. <i>Visualization of Spreadsheet Models.</i> 3. <i>Oracle Database Connectivity using Python</i> 4. <i>Visualization of Semi-Structured Data</i>	6
III	Tableau Calculations Calculations - Operators - Functions - Numeric Calculations - String Calculations - Date Calculations - Table Calculations - LOD Expressions <i>Programs</i>	10
	5. <i>Creating simple calculations in Tableau.</i>	2
IV	Tableau Filter Data Basic Filters - Filter Operations - Extract Filters - Quick Filters - Context Filters - Condition Filters - Data Source Filters - Top Filters - Sort Data - Build Groups - Tableau Build Hierarchy - Build Sets. <i>Programs</i>	6
	6. <i>Visual Encodings and Basic Dashboards in Tableau.</i> 7. <i>Interactive Plots in Python.- Interactivity with text and visual tooltips, actions</i> 8. <i>Hierarchical and Topographical Data Visualizations in Tableau.</i>	6
V	Charts & Graphs Bar Chart - Line Chart - Pie Chart - Bubble Chart - Bump Chart - Gantt Chart - Crosstab Chart - Motion Chart -Waterfall Chart - Bullet Chart - Area Chart - Pareto Chart - Dual Axis Chart - Box Plot -Heat Map - Tree Map - Scatter Plot - Histogram. <i>Programs</i>	6
	9. <i>Calendar Heatmaps and Flow Data Visualizations in Python.</i> 10. <i>Time Series Data Visualization in Python.</i> 11. <i>Creating a data story in Tableau</i> 12. <i>Dashboards, Actions and Story Telling in Tableau</i>	6
Total Instructional Hours		60

COURSE
OUTCOME

CO1 : Comprehend the architecture and interface of Tableau, including workspace control and navigation.

CO2 : Demonstrate proficiency in extracting data from various sources, such as text files, Excel, and databases, and editing metadata.

CO3: Analyze and blend data from multiple sources, sort and replace data sources in Tableau for effective visualization.

CO4 : Evaluate different data terminology and types, including data aggregation and file types, for appropriate visualization techniques.

CO5 : Analyze calculations in Tableau, including operators, functions, numeric, string, date, and table calculations, to derive meaningful insights.

REFERENCE BOOKS:

R1. Clous O. Wilke, Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures, O'Reilly Media, Inc.", 18-Mar-2019

R2. Kieran Healy, Data Visualization: A Practical Introduction, Princeton University Press, 2018.

R3. Joshua N. Milligan, Learning Tableau 2020: Create effective data visualizations, build interactive visual analytics, and transform your organization, 4th Edition 4th ed. Edition, 2020

R4. By Alexander Loth, , Visual Analytics with Tableau, Wiley Publisher, 2019.

R5. Shweta Sankhe-Savale, Tableau Cookbook – Recipes for Data Visualization, Packt Publishing, 2016

R6. Prachi Manoj Joshi, Parikshit Narendra Mahalle, Data Storytelling and Visualization with Tableau: A Hands-on Approach, CRC Press, 2023.

R7. Kristina Chodorow, "MongoDB: The Definitive Guide", O'Reilly 2013


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21EC3251	INTERNET OF THINGS	2	0	2	3

- Course Objective
- To understand the fundamentals of Internet of Things.
 - To understand the IoT design methods and their Concepts
 - To build a small low-cost embedded system using Galileo/Arduino or equivalent boards.
 - To understand the concept of advanced high power Raspberry Pi board.
 - To get an idea where the application areas are available for the Internet of Things.

Unit	Description	Instructional hours
I	Introduction to IoT Introduction – Physical and Logical design of IoT – IoT Enabling Technologies – IoT levels and deployment templates.	6
II	IoT Design Methodology IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.	6
III	Building IoT with Galileo/Arduino Introduction to Intel Galileo Gen2/Arduino- Interfaces - Arduino IDE – Programming	6
IV	Getting Started with Raspberry Pi About the Board – Linux on Raspberry Pi - Interfaces - Programming Raspberry Pi with python – Examples.	6
V	Application Development Home Automation – Cities – Environment: Weather monitoring system – Forest Fire detection – Agriculture – Productivity Applications.	6
	Practicals	
	1. Introduction to Intel Galileo Gen2/Arduino Uno and LED Interfacing	
	2. Sensor Interfacing with Intel Galileo Gen2/Arduino Uno	
	3. Raspberry Pi - Introduction and installation of OS	
	4. Home automation using Pi	
	5. Using Node-RED Visual Editor on Rpi	
	6. IoT Applications based on Pi	
	7. Mini Project	15
	Total Instructional hours	45


- Course Outcome
- CO1: Describe IoT with various tools.
 - CO2: Design IoT using various methodologies
 - CO3: Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
 - CO4: Deploy an IoT application and connect to the cloud using Raspberry Pi.
 - CO5: Analyze applications of IoT in real time scenario

TEXT BOOKS:

- T1- ArshdeepBahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015.
T2- Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.

REFERENCES:

- R1- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine - to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
R2- Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
R3 - Raspberry Pi cookbook: Software and hardware problems and solutions, Monk, Simon. O'Reilly Media, Inc., 2016.
R4- The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick – Wiley Publications -2012.


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3001	MINI PROJECT	0	0	3	1.5

- Course Objective
1. To understand the problem and develop solutions.
 2. To understand Software life cycle model.
 3. Have knowledge to identify the tools for a project development.
 4. To have knowledge about planning the completion of the project.
 5. To know the method of presenting the project.

Sl. No. Description of the Experiments

1. Students shall develop creative or innovative project.
2. Need to submit a report, presentation with demo.
3. User Based Testing and feedback from the benefited society required.

Students can select topics from either one of the following domain

4.
 - Application based or
 - Algorithms-based projects
 - Data Analysis Projects
 - Simulation Projects
 - Optimization Projects
 - Automation Projects
 - Web Development Projects
 - Mobile App Development Projects

Total Practical Hours 45

COURSE OUTCOME

- CO1: Develop skill to create practical solutions to identified problem.
 CO2: Use software lifecycle model and other artifacts appropriate for problem.
 CO3: Identify and master tools required for the project.
 CO4: Plan and work systematically towards completion of a project work.
 CO5: Develop the ability to explain and defend their work in front of an evaluation panel.


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3003	DEEP LEARNING LAB	0	0	3	1.5

Course Objective	Description
	<ol style="list-style-type: none"> To provide practical hands-on experience in deep learning concepts and techniques. Build neural network architectures, model training and evaluation, pre-trained model usage. Construct object detection, image segmentation using convolution neural networks. Develop applications using Recurrent Neural Networks. Implement sentiment Analysis using RNN

S.No.	Description of the Experiments	Practical Hours
1.	Given a dataset of input-output pairs $\{(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)\}$, where x represents the input and y represents the corresponding output, Find the best-fitting line that minimizes the mean squared error loss between the predicted output and the actual output. Use Gradient descent Optimization.	3
2.	Design and build a neural network model with back propagation from scratch or using a deep learning framework to classify Iris flowers, considering various architectures and optimization strategies.	6
3.	Design a sequential neural network model and train it using Keras to classify the Pima Indians Diabetes dataset, and evaluate the model's accuracy and save the model for future use.	3
4.	Explain how to load a pre-trained Keras model from disk, make predictions on the Pima Indians Diabetes dataset, and interpret the results.	6
5.	Design and build a convolution neural network and train using Keras to classify the MNIST digit dataset? Evaluate the model's accuracy and visualized the performance using accuracy and loss graphs	3
6.	Perform object detection using any detector model and Open CV in python. Load the model and the camera feed processes to detect objects in real time. The detected object should be labeled and bounded by rectangle.	3
7.	Perform image segmentation using a Convolution Neural Network in Python by including loading an image from the given dataset, defining the CNN model, training the model, and visualizing the segmented image.	3
8.	Analyze historical stock prices of IBM using a Long Short term Memory based recurrent neural network and use dataset to preprocess, construct and train a Long Short term Memory model for predicting stock prices, and evaluate the model's performance using root mean squared error. Furthermore, demonstrate how to visualize the predicted stock prices alongside the actual prices, fostering a deeper understanding of the model's predictions and their alignment with real-world data?	6
9.	Implement the Gated Recurrent Unit architecture for predicting IBM stock prices. Code Gated Recurrent Unit into the model, layer configuration, activation functions, and regularization techniques used.	6
10.	Implement Sentiment Analysis using BERT	6
Total Instructional hours		45

Course Outcome	Description
	CO1: Analyze the impact of each activation function on the model's training convergence, accuracy, and loss.
	CO2: Building of applications using Neural Network Architecture
	CO3: Construct and train convolution neural networks for object detection and image segmentation
	CO4: Developing of Recurrent Neural Network models for various sequence generation and classification tasks.
	CO5: Develop sentiment analysis applications applied to real world.


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PROFESSIONAL ELECTIVE

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3301	ACCOUNTING AND FINANCIAL MANAGEMENT	3	0	0	3

- COURSE OBJECTIVE**
1. Understand the basic accounting concepts and preparation of financial statements
 2. Understand various techniques of financial statement analysis.
 3. Gain a comprehensive understanding in analysis of fund flow and cash flow and application of cost accounting technique to ascertain the cost of products and services
 4. Understand the application of marginal costing techniques, preparation and presentation of budgets in business and its implementation.
 5. To Expose the students to the concept of financial management, time value of money and investment decision on projects

Unit	Description	Instructional Hours
FINANCIAL ACCOUNTING		
I	Financial Accounting – Accounting Concepts and conventions - Double entry principles of book keeping -Journal entry- Ledger-Trial Balance- Final Accounts.	9
FINANCIAL STATEMENT ANALYSIS		
II	Analysis of financial statements -Techniques of financial analysis - Comparative Statement-Common size statement-Trend Analysis-RatioAnalysis.	9
COST AND MANAGEMENT ACCOUNTING		
III	Management Accounting – Funds Flow Analysis - Cash Flow Analysis - Cost Accounting- Functional classification of cost - Preparation of Cost Sheet	9
MARGINAL COSTING AND BUDGETARY CONTROL		
IV	Marginal costing - Break Even Analysis- Applications of marginal costing- Meaning of budget and budgetary control. Preparation of budget -Cash budget- flexible budget and other budgets.	9
FINANCIAL MANAGEMENT		
V	Financial Management - Objectives and functions - Concept of Time value of money- Techniques in computation of time value of money - Capital Budgeting Decision- Methods of appraisal capital budgeting.	9

Total Instructional Hours 45

- COURSE OUTCOME**
- CO1: Apply basic accounting concepts and preparation of financial statements
CO2: Knowledge in various techniques of financial statement analysis
CO3: Ascertain the cost of products and services through the analysis of fund flow and cash flow and application of cost accounting technique.
CO4: Apply marginal costing techniques for preparation and presentation of budgets in business
CO5: usage of financial management, time value of money and investment decision on projects.

REFERENCE BOOKS:

- 1.R.S.N. Pillai and V.Bagavathi, Financial Accounting, S.Chand publishing, New Delhi 2019.
- 2.R.S.N. Pillai and V.Bagavathi, Cost Accounting, S.Chand publishing, New Delhi 2019
3. M Y Khan and P K Jain, Financial Management– Text, Problems and Cases, Tata McGraw Hill, New Delhi 2019.
4. John J.Hampton, —Financial Decision Making –Concepts, Problems and Cases| Prentice Hall of India (P) Ltd., New Delhi, 2019


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3303	SOFT COMPUTING TECHNIQUES	3	0	0	3
COURSE OBJECTIVE	<ol style="list-style-type: none"> To gain knowledge of soft computing theories and its fundamentals. To design a soft computing system required to address a computational task. To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetical algorithms in problem solving and use of heuristics based on human experience. To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems. To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self-learning situations 					


Unit	Description	Instructional Hours
	FUZZY COMPUTING	
I	Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion Membership Functions, Interference in Fuzzy Logic, Fuzzy If – Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzification and Defuzzification, Fuzzy Controller, Industrial Applications.	9
	FUNDAMENTALS OF NEURAL NETWORKS	
II	Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning techniques, Perception and convergence Rule. Auto-Associative and Hetero-Associative Memory	9
	BACKPROPAGATION NETWORKS	
III	Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perceptron Model; Back Propagation Learning Methods, Effect of Learning Rule Co – Efficient; Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications	9
	COMPETITIVE NEURAL NETWORKS	
IV	Kohonen's Self Organizing Map – SOM Architecture, learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.	9
	GENETIC ALGORITHM	
V	Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations-Encoding Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications	9
	Total Instructional Hours	45

COURSE OUTCOME

CO1: Identify and describe soft computing techniques and their roles in building intelligent machines.
CO2: Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO3: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
CO4: Apply genetic algorithms to optimization problems.
CO5: Design neural networks to pattern classification and regression problems using a soft computing approach.

REFERENCES BOOKS:

- J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro – Fuzzy and Soft Computing", Pearson Education, 2004.
- S. Rajasekaran and G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications", PHI Learning, 2nd Edition, 2017.
- S. N. Sivanandam, S. N. Deepa, "Principles of Soft Computing", Third Edition, Wiley, 2018.
- Simon Haykin, "Neural Networks and Learning Machines", Pearson, 3rd Edition, 2009.
- Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 4th Edition 2016.


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3305	E-COMMERCE	3	0	0	3

COURSE OBJECTIVE

1. Knowledge of various e-commerce business models;
2. Understanding telecommunication network, hardware, and software technologies;
3. Use of e-commerce in companies to gain competitive advantages;
4. How to plan and execute e-commerce projects;
5. The competitive strategies of leading e-commerce companies in the world.

Unit	Description	Instructional Hours
I	INTRODUCTION Information technology and Business-E-Commerce-EDI-E-Commerce types-E-Commerce and World Wide Web-Internet Connectivity-E-Commerce – case studies leading the Transformation-E-Governance case studies leading the Transformation – - Internet communication protocols-Internet services and Resources-Internet Mail-Internet search-issues of concern-Browsers-HTML Java-Internet 2	9
II	BUILDING BLOCKS FOR E-COMMERCE Electronic Data Interchange -. costs and benefits – Components of EDI systems- EDI Implementation issues-Identification and tracking tools-The EAN, EANCOM- riticle numbering-bar coding – EAN location numbering –RFID-Business Process Reengineering-Approaches to BBR-Strategic alignment model-BBR Methodology-Management of change- change management – the change management in the government – the implementation plan	9
III	CYBER SECURITY Legal issues – Risks – paper documents vs electronic document-technology for authenticating electronic document-Laws for E-Commerce - Cyber-attack-hacking-firewalls-Intrusion Detection System-Secure Socket layer-authentication and assurance of data integrity-cryptography based solutions-digital signature-the protocols for secured messaging-guidelines for cryptography policy-Virtual Private Network. Cybercrimes and Information technology act 2000- cyber forensics	9
IV	IT ACT 2000 Trust in the Electronic environment-electronic authentication-paper-vs electronic world-The IT act 2000-cybercrimes under the IT act. Public key infra structure- PKI and Certifying Authorities – Electronic payment systems and internet banking-payment gateway-Internet banking-PayPal- Secure Electronic Transaction protocol-electronic cash- electronic cheque- elements of electronic payments	9
V	CASE STUDIES E-Commerce Case Studies- E-Commerce in India- Indiatimes.com-Rediff.com-Bazee.com-Steel Authority of India-Amul- the taste of India	9
Total Instructional Hours		45

COURSE OUTCOME

CO1: Comprehend the underlying economic mechanisms and driving forces of E-Commerce;
CO2: Understand the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders;
CO3: Appraise the opportunities and potential to apply and synthesize a variety of E-Commerce concepts and solutions to create business value for organizations, customers, and business partners;
CO4: Formulate E-Commerce strategies that lever firms' core competencies, facilitate organizational transformation, and foster innovation;
CO5: Undertake planning, organizing, and implementing of E-Commerce initiatives to effectively respond to of dynamic market environments.

REFERENCE BOOKS:

1. Jeffrey F. Rayport and Bernard J. Jaworski, "Introduction to ECommerce", 2nd Edition, Tata Mc-Graw Hill Pvt., Ltd., 2003.
2. Greenstein, "Electronic Commerce", Tata Mc-Graw Hill Pvt., Ltd., 2000
3. Kamalesh K. Balaji, Debjani Nag, "E-Commerce", Second Edition, McGraw Hill Education, 2015

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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3306	MIXED REALITY	3	0	0	3

- COURSE OBJECTIVE**
1. To understand the basic concepts of Mixed Reality.
 2. To design and develop the Mixed Reality applications in different domains.
 3. To Design various models using modeling techniques.
 4. To Perform Mixed Reality Programming with toolkits.
 5. To Evaluate mixed reality-based applications.


Unit	Description	Instructional Hours
	INTRODUCTION	
I	Introduction to Virtual Reality (VR) – Definition – Three I’s VR – VR vs 3D Computer Graphics – Benefits – Components of VR – Introduction to AR – System Structure – Key Technology in AR – 3D Vision – Approaches – Alternative Interface Paradigms – Spatial AR – Input Devices – 3D Position Trackers – Performance Parameters – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.	9
	MIXED REALITY COMPUTING ARCHITECTURE	
II	Computing Architectures of VR – Workstation Based Architectures – SGI Infinite Reality Architecture – Distributed VR Architectures – Multi-pipeline Synchronization – AR Architecture – Taxonomy, technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.	9
	MR MODELING	
III	Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants – Object Hierarchies – Viewing The 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing And Mapping – Behavior Modeling – Model Management.	9
	MR PROGRAMMING	
IV	VR Programming – Toolkits and Scene Graphs – World Toolkit – Java 3D – Comparison of World Tool kit and Java3D – GHOST – People Shop – Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society – Mixed Reality Coding – Trajectories through Mixed Reality Performance – Mobile Interface Design – Quantitative Evaluation – Qualitative Evaluation.	9
	APPLICATIONS	
V	Medical Applications of MR – Education, Arts and Entertainment – Military MR Applications – Emerging Applications of MR – MR Applications in Manufacturing – Applications of MR in Robotics – Information Visualization – Wearable Computing – Games	9
Total Instructional Hours		45

- COURSE OUTCOME**
- CO1: Discuss the basic concepts of Mixed Reality.
 - CO2: Design and develop the Mixed Reality applications in different domains.
 - CO3: Design various models using modelling techniques.
 - CO4: Perform Mixed Reality Programming with tool kits.
 - CO5: Evaluate mixed reality-based applications.

REFERENCE BOOKS:

- R1. Grigore C. Burdea, Philip Coiffet, “Virtual Reality Technology”, Second Edition, Wiley India, 2017.
- R2. Benford, S., Giannachi G., “Performing Mixed Reality”, MIT Press, 2011.
- R3. Charles Palmer, John Williamson, “Virtual Reality Blueprints: Create Compelling VR Experiences for Mobile”, Packt Publisher, 2018.

- R4. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality" Association for Computing Machinery and Morgan, Claypool Publishers, 2015
- R5. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003
- R6. Kelly S. Hale, Kay M. Stanney Handbook of Virtual Environments: Design, Implementation, and Applications, Second Edition, CRC press, 2014


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3307	ORGANIZATIONAL BEHAVIOR	3	0	0	3

COURSE OBJECTIVE

1. To make students understand the importance of organizational behavior and organization structure.
2. To gain insight about various aspects related to individuals' behavior in an organization.
3. To comprehend the foundations of Group behavior in organization
4. To expose students to various leadership styles and the influence of Power and politics in organization.
5. To enable students familiar with organizational culture and the dynamics of organizational behavior.

Unit	Description	Instructional Hours
	INTRODUCTION	
I	Manager's functions, roles and skills. Organizational behavior: Definition – contributing disciplines - challenges and opportunities – Developing an OB Model - Organizational behaviour models. Organization structure: key elements – common organizational designs - determinants.	9
	INDIVIDUAL BEHAVIOUR	
II	Personality: Definition - determinants – MBTI, Big Five, 16 PF and other personality traits. Values – terminal Vs instrumental values. Emotions - Emotional Labour – Emotional Intelligence. Attitude – components – major job attitudes. Job satisfaction: causes – consequences. Perception – factors influencing perception – attribution theory. Motivation – early theories – contemporary theories.	9
	GROUP BEHAVIOUR	
III	Groups: Meaning – stages of group development – properties – group decision making. Teams: Types – creating effective teams. Communication: Functions – process – direction of communication – interpersonal communication – organizational communication – barriers.	9
	LEADERSHIP AND POWER	
IV	Leadership: Meaning – trait theories, behavioural theories, contingency theories. Power – bases of power – power tactics. Politics – causes and consequences. Impression Management.	9
	ORGANIZATIONAL CULTURE AND DYNAMICS	
V	Organizational culture: Definition – functions – creating and sustaining culture. Organizational change: forces – planned change – resistance to change – approaches to manage change. Stress: Meaning – potential sources – consequences of stress – Managing stress.	9
	Total Instructional Hours	45

COURSE OUTCOME	Description
	CO1: Understand the importance of organizational behavior and organization structure.
	CO2: Understand aspects like personality, learning, emotions, attitudes, perceptions, motivation etc which affects individual's behavior in an organization.
	CO3: Remember and Understand how to handle group behavior effectively.
	CO4: Remember and Understand various leadership styles and the influence of Power and Politics in organization.
	CO5: Understand organizational culture and the dynamics of organizational behavior.

REFERENCE BOOKS:

- R1 - Fred Luthans, "Organizational Behavior", McGraw Hill, 12th Edition, 2013.
R2 - Steven McShane and Mary Von Glinow, "Organizational Behavior", 4th Edition, 2019.
R3- Schermerhorn, Hunt and Osborn, "Organizational behavior", John Wiley, 9th Edition, 2011.


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Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3308	RESEARCH METHODOLOGY	3	0	0	3
COURSE OBJECTIVE	1. To identify appropriate research problem, 2. To Understand the process of Literature Review 3. To write a research report and thesis 4. To understand the basis of IPR 5. To understand all information regarding Patent					

Unit	Description	Instructional Hours
	RESEARCH PROBLEM FORMULATION	
I	Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations.	9
	LITERATURE REVIEW	
II	Effective literature studies approaches, analysis, plagiarism, and research ethics.	9
	TECHNICAL WRITING /PRESENTATION	
III	Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.	9
	INTELLECTUAL PROPERTY RIGHTS	
IV	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	9
	PATENT AND LICENSING	
V	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	9
Total Instructional Hours		45

COURSE OUTCOME	CO1. Ability to formulate research problem CO2. Ability to carry out research analysis CO3. Ability to follow research ethics CO4. Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity CO5. Ability to understand about IPR and filing patents in R & D.
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REFERENCE BOOKS:

- R1. Garg. B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
- R2. Kothari, C.R.(2008). Research Methodology: Methods and Techniques. Second Edition. New Age International Publishers, New Delhi.
- R3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss Publications. 2 volumes.
- R4. Gupta S.P. (2008). Statistical Methods. 37th ed. (Rev)Sultan Chand and Sons. New Delhi. 1470 p.
- R5. Leon & Leon (2202). Internet for everyone, Vikas Publishing House.
- R6. Wadehra, B.L.2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.
- R7. Research Methodology Dr P M Bulakh, Dr P. S. Patki and Dr A S Chodhary 2010 Published by Expert Trading Corporation Dahisar West, Mumbai 400068

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Programme	Course Code	Name of the Course	L	T	P	C
MCA	20CA3309	SEMANTIC WEB SERVICES	3	0	0	3

- COURSE OBJECTIVE**
1. To learn the fundamentals of semantic web and to conceptualize and depict ontology for semantic web.
 2. To make a study of languages for semantic web.
 3. To learn about the ontology learning algorithms and to utilize in the development of an application.
 4. To know the fundamental concepts of ontology management.
 5. To learn the applications related to semantic web.

Unit	Description	Instructional Hours
I	THE QUEST FOR SEMANTICS Building Models – Calculating with Knowledge – Exchanging Information – Semantic Web Technologies – Layers – Architecture – Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background – Sample Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation.	9
II	LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES Web Documents in XML – RDF – Schema – Web Resource Description using RDF – RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics – Traditional Ontology Languages – LOOM – OKBC – OCML – FLogic Ontology Markup Languages – SHOE – OIL – DAML + OIL – OWL	9
III	ONTOLOGY LEARNING FOR SEMANTIC WEB Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms – Methods for Evaluating Ontologies	9
IV	ONTOLOGY MANAGEMENT AND TOOLS Overview – Need for Management – Development Process – Target Ontology – Ontology Mapping – Skills Management System – Ontological Class – Constraints – Issues, Evolution – Development Of Tools And Tool Suites – Ontology Merge Tools – Ontology Based Annotation Tools.	9
V	APPLICATIONS Web Services – Semantic Web Services – Case Study for Specific Domain – Security Issues – Web Data Exchange and Syndication - Semantic Wikis – Semantic Portals – Semantic Metadata in Data Formats – Semantic Web in Life Sciences – Ontologies for Standardizations – Rule Interchange Format	9
Total Instructional Hours		45

- COURSE OUTCOME**
- CO1: Create ontology for a given domain.
 CO2: Develop an application using ontology languages and tools.
 CO3: Understand the concepts of semantic web.
 CO4: Use ontology related tools and technologies for application creation.
 CO5: Design and develop applications using semantic web.

REFERENCES BOOKS:

1. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies", Chapman & Hall/CRC, 2009.
2. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez "Ontological Engineering: with Examples from the Areas of Knowledge Management, Ecommerce and the Semantic Web", Springer, 2004.
3. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004.
4. Alexander Maedche, "Ontology Learning for the Semantic Web", Springer, 2002.
5. John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology –Driven Knowledge Management", John Wiley, 2003.
6. John Davies, Rudi Studer, Paul Warren, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley, 2006.

A. V. Jay
 Chairman – BoS
Chairman - BoS
MCA - HiCET



[Signature]
 Dean – Academics
Dean (Academics)
HiCET

Programme	Course Code	Name of the Course	L	T	P	C
MCA	21CA3310	FUNDAMENTALS OF CLOUD COMPUTING	3	0	0	3


- COURSE OBJECTIVE**
- To understand the concept of cloud and utility computing.
 - To understand the various issues in cloud computing.
 - To familiarize themselves with the lead players in cloud.
 - To appreciate the emergence of cloud as the next generation computing paradigm.
 - To be able to set up a private cloud.

Unit	Description	Instructional Hours
	INTRODUCTION	
I	Evolution of Cloud Computing –System Models for Distributed and Cloud Computing–NIST Cloud Computing Reference Architecture - -IaaS–On-demand Provisioning -Elasticity in Cloud – IaaS Providers -PaaS – PaaS Providers –SaaS – SaaS Providers – Public, Private and Hybrid Clouds.	9
	VIRTUALIZATION	
II	Basics of Virtualization -Types of Virtualizations -Implementation Levels of Virtualization - Virtualization Structures -Tools and Mechanisms -Virtualization of CPU, Memory, I/O Devices Desktop Virtualization –Server Virtualization.	9
	CLOUD INFRASTRUCTURE	
III	Architectural Design of Compute and Storage Clouds –Layered Cloud Architecture Development – Design Challenges -Inter Cloud Resource Management–Resource Provisioning and Platform Deployment –Global Exchange of Cloud Resources.	9
	PROGRAMMING MODEL	
IV	Parallel and Distributed Programming Paradigms –Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache –Mapping Applications Programming Support –Google App Engine, Amazon AWS -Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack.	9
	SECURITY IN THE CLOUD	
V	Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security –Application Security –Virtual Machine Security.	9
Total Instructional Hours		45


- COURSE OUTCOME**
- CO1: Analyze various cloud programming models and apply them to solve problems on the cloud.
CO2: Build cloud architecture.
CO3: Explain the core concepts of the cloud computing paradigm.
CO4: Get clear knowledge of various cloud models and their services, characteristics, advantages and Challenges.
CO5: Interpret the security issues in cloud

REFERENCE BOOKS:

- Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
- John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press,2010.
- Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
- George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly, 2009.
- James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems andProcesses", Elsevier/Morgan Kaufmann, 2005.


Chairman – BoS
Chairman - BoS
MCA - HiCET




Dean – Academics
Dean (Academics)
HiCET

CO'S, PO'S & PSO'S MAPPING

Academic Year 2023 - 2024 - Semester – I - Batch 2023 - 2025

Course Code & Name **21CA1202 : Computer Networks**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	2	3	2	1			0	0	0	0	0	0	2	3
CO2	2	1	2	3	2	1	0	0	0	0	0	0		1
CO3	2	1	2	3	2	1	0	0	0	0	0	0		1
CO4	2	3	2	1			0	0	0	0	0	0	2	3
CO5	2	1	2	3	2	1	0	0	0	0	0	0		1
Average	2	1.8	2	2.2	2	1	0	0	0	0	0	0	2	1.8

Course Code & Name **21CA1203R- Java Programming**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO2	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO3	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO4	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO5	0	3	3	2	3	0	2	3	0	2	3	3	3	1
Average	0.4	2.6	2.6	2	2.6	0.4	2	2.6	0.4	2	2.6	2.6	2.6	1.4

Course Code & Name **21CA1204- Database Management Systems**

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO2	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO3	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO4	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO5	0	3	3	2	3	0	2	3	0	2	3	3	3	1
Average	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.6

Course Code & Name **21CA1205- Probability And Statistics**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	3	3	3	2	2	1	1	1	0	1	0	2	1	0
CO2	3	3	3	2	3	1	1	1	-	1	-	2	1	-
CO3	3	3	3	3	3	1	1	1	-	1	-	2	1	-
CO4	3	3	3	3	3	1	1	1	-	1	-	2	1	-
CO5	3	3	3	3	3	1	1	1	-	1	-	2	1	-
Average	3	3	3	2.6	2.8	1	1	1	0	1	0	2	1	0

Course Code & Name **21CA1251- UI Design & Development**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	2	2	3	1	1	0	2	0	0	0	0	0	2	1
CO2	2	2	2	1	2	0	2	0	1	0	1	0	2	1
CO3	3	2	2	1	3	0	2	0	0	0	1	0	2	1
CO4	2	2	2	1	2	0	2	0	0	0	1	0	2	2
CO5	2	2	3	1	3	0	3	0	1	0	2	0	3	1
Average	2.2	2	2.4	1	2.2	0	2.2	0	0.4	0	1	0	2.2	1.2

Course Code & Name 21CA1001R- Java Programming Lab

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	3	3	3	3	2	2	2	0	0	0	1	0	3	3
CO2	3	3	3	3	2	2	2	0	0	0	0	1	3	3
CO3	3	3	3	3	1	2	2	0	3	0	1	0	3	3
CO4	3	3	3	3	1	2	2	0	2	0	0	0	3	3
CO5	3	3	3	3	1	2	2	0	3	0	0	0	3	3
Average	3	3	3	3	1.4	2	2	0	1.6	0	0.4	0.2	3	3

Course Code & Name 21CA1002- DBMS Lab

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PS O1	PS O2
CO1	3	3	3	2	3	2	3	0	0	0	1	1	3	1
CO2	3	3	3	2	3	2	2	1	0	0	0	0	3	1
CO3	3	3	3	3	2	1	3	0	0	0	1	0	3	1
CO4	3	3	2	3	3	1	2	0	0	0	0	1	3	2
CO5	3	3	3	3	2	1	3	1	0	0	0	0	3	1
Average	3	3	2.8	2.6	2.6	1.4	2.6	0.4	0	0	0.4	0.4	3	1.2

CO'S, PO'S & PSO'S MAPPING

Academic Year 2023 - 2024 - Semester – III - Batch 2022 - 2024

Course Code & Name 21CA3205-Cryptography and Network Security

PO & PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	0	3	3	0	3	3	0	0	0	3
Average	3	3	3	3	2.4	3	3	2.4	3	3	2.4	2.4	2.4	3

CO'S, PO'S & PSO'S MAPPING

Academic Year 2023 - 2024 - Semester – III - Batch (2022 - 2024) - List of Electives

Course Code & Name 21CA3301- Accounting and Financial Management

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO2	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO3	1	2	2	3	2	1	3	2	1	3	2	2	2	2
CO4	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO5	3	0	0	1	0	3	1	0	3	1	0	0	0	2
Average	1.2	1.75	1.75	1.2	1.5	1.2	1.2	1.5	1.2	1.2	1.5	1.5	1.5	1.4

Course Code & Name 21CA3303- Soft Computing Techniques

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO2	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO3	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO4	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO5	1	2	2	3	0	1	3	0	1	3	0	0	0	2
Average	2.4	0.5	0.5	1.2	0	2.4	1.2	0	2.4	1.2	0	0	0	1.8

Course Code & Name 21CA3305- E-Commerce

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO2	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO3	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO4	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO5	3	0	0	1	0	3	1	0	3	1	0	0	0	2
Average	2.4	0.6	0.6	1.2	0.6	2.4	1.2	0.6	2.4	1.2	0.6	0.6	0.6	1.8

Course Code & Name 21CA3306- Mixed Learning

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO2	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO3	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO4	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO5	2	1	1	2	0	2	2	0	2	2	0	0	0	3
Average	2	0.7	0.7	0.8	0.3	2.0	0.8	0.3	2.0	0.8	0.3	0.3	0.3	1.8

Course Code & Name **21CA3307- Organizational Behaviour**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO2	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO3	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO4	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO5	2	–	–	0	0	2	0	0	2	0	0	0	0	1
Average	2	0.75	0.75	1.2	0.6	2	1.2	0.6	2	1.2	0.6	0.6	0.6	2.2

Course Code & Name **21CA3308- Research Methodology**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO2	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO3	1	2	2	3	2	1	3	2	1	3	2	2	2	2
CO4	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO5	2	1	1	2	0	2	2	0	2	2	0	0	0	3
Average	2.0	1.0	1.0	1.2	0.7	2.0	1.2	0.7	2.0	1.2	0.7	0.7	0.7	1.8

Course Code & Name **21CA3309- Semantic Web Services**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO2	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO3	1	2	2	3	2	1	3	2	1	3	2	2	2	2
CO4	2	0	0	0	0	2	0	0	2	0	0	0	0	1
CO5	0	3	3	2	0	0	2	0	0	2	0	0	0	1
Average	1.4	1.5	1.5	1.4	0.75	1.4	1.4	0.75	1.4	1.4	0.75	0.75	0.75	1.6

Course Code & Name **21CA3310- Fundamentals of Cloud Computing**

PO& PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	2	1	1	2	1	2	2	1	2	2	1	1	1	3
CO2	3	0	0	1	0	3	1	0	3	1	0	0	0	2
CO3	0	3	3	2	3	0	2	3	0	2	3	3	3	1
CO4	1	2	2	3	2	1	3	2	1	3	2	2	2	2
CO5	3	0	0	1	0	3	1	0	3	1	0	0	0	2
Average	1.8	1.2	1.2	1.8	1.2	1.8	1.8	1.2	1.8	1.8	1.2	1.2	1.2	2.0

Academic Year 2023 - 2024 - Semester – I - Batch (2023 - 2025)

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
I	I	21CA1202 Computer Networks	2	1.8	2	2.2	2	1	0	0	0	0	0	0	2	1.8	
		21CA1203R - Java Programing	0.4	2.6	2.6	2	2.6	0.4	2	2.6	0.4	2	2.6	2.6	2.6	1.4	
		21CA1204 - Database management system	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.6
		21CA1205- Probability and Statistics	3	3	3	2.6	2.8	1	1	1	0	1	0	2	1	0	
		21CA1251- UI Design and Development	2.2	2	2.4	1	2.2	0	2.2	0	0.4	0	1	0	2.2	1.2	
		20CA1001R - Java Programing Lab	3	3	3	3	1.4	2	2	0	1.6	0	0.4	0.2	3	3	
		20CA1002 - Database management system Lab	3.0	3.0	2.8	2.6	2.6	1.4	2.6	0.4	0.0	0.0	0.4	0.4	3.0	1.2	

Academic Year 2023 - 2024 - Semester –III - Batch (2022 - 2024)

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
II	III	21CA3205- Cryptograph y and Network Security	3	3	3	3	2.4	3	3	2.4	3	3	2.4	2.4	2.4	3

		21CA3206- Deep Learning Techniques	2.8	1.6	2.6	1.4	3	0.6	0	1.4	0	0	0	0.8	2.2	3
		21CA3252- Data visualization using Tableau	2.2	0.4	0.4	1.2	0.4	2.2	1.2	0.4	2.2	1.2	0.4	0.4	0.4	1.6
		21EC3251- Internet of Things	3.0	1.6	2.8	1.8	2.2	2.0	1.3	1.3	0.0	0.0	1.0	1.2	2.6	3.0
		21CA3003- Deep Learning Lab	3	3	3	2.6	2.8	0	0	0	0	0	0	0	3	2.4

Academic Year 2023 - 2024 - Semester – III - Batch (2022 - 2024) - List of Electives

Year	Sem	Course code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
I	Electives Sem II	21CA3301- Accounting and Financial Management	1.2	1.75	1.75	1.2	1.5	1.2	1.2	1.5	1.2	1.2	1.5	1.5	1.5	1.4
		21CA3303- Soft Computing Techniques	2.4	0.5	0.5	1.2	0	2.4	1.2	0	2.4	1.2	0	0	0	1.8
		21CA3305- E-Commerce	2.4	0.6	0.6	1.2	0.6	2.4	1.2	0.6	2.4	1.2	0.6	0.6	0.6	1.8
		21CA3306- Mixed Reality	2.0	0.7	0.7	0.8	0.3	2.0	0.8	0.3	2.0	0.8	0.3	0.3	0.3	1.8
		21CA- Organizational Behaviour	2	0.75	0.75	1.2	0.6	2	1.2	0.6	2	1.2	0.6	0.6	0.6	2.2

	21CA3308- Research Methodolog y	2.0	1.0	1.0	1.2	0.7	2.0	1.2	0.7	2.0	1.2	0.7	0.7	0.7	1.8
	21CA3309- Semantic Web services	1.4	1.5	1.5	1.4	0.7 5	1.4	1.4	0.75	1.4	1.4	0.75	0.75	0.7 5	1.6
	21CA3310- Fundamental s of Cloud Computing	1.8	1.2	1.2	1.8	1.2	1.8	1.8	1.2	1.8	1.8	1.2	1.2	1.2	2.0



BoS Chairman



Dean Academics