MCA
Semester-I
Syllabus
Effective
from
June-2021

Gujarat Vidyapith

Department of Computer Sc.

(Faculty of Management and Technology)

Teaching & Evaluation Scheme

Name of Program: Master in Computer Application

Effective from Academic Year-2021-22

MCA Semester-I

Sr. No.	Subject Code	Name of the Subject	Teaching Hours / Week				Evaluation Scheme / Semester								
							Theory					Practical (Marks)			Total
							Internal Exam		University Exam		Theory Total	Internal Practical/ Viva Exam*	University Practical Exam	Practical Total	
			Th	Tu	Pr	Credit Total	Marks	Hrs	Marks	Hrs					
1	MCA-101	Object Oriented Programming Using JAVA (ઑબ્જેક્ટ ઓરીએન્ટેડ પ્રોગ્રોમીંગ યુઝીંગ જાવા)	4		4	4+2	40	2	60	2½	100	40	60	100	200
2	MCA-102	Data Structure (માહિતીની આંતરિક સંરચના અને ગોઠવણી)	4		4	4+2	40	2	60	2½	100	40	60	100	200
3	MCA-103	Mathematical and Statistical Computing with Python (પાયથોન વડે ગાણિતિક અને આંકડાકીય ગણતરી)	3		4	3+2	40	2	60	2½	100	40	60	100	200
4	MCA-104	Database Management System (ડેટાબેઝ મેનેજમેન્ટ સિસ્ટમ)	3		2	3+1	40	2	60	2½	100	40	60	100	200
5	BRIDGE COURSE-1	Programming Language ("C") (સંકમાદેશ ભાષા ("સી"))	1				40	2			40				
6	BRIDGE COURSE-2	Web Technology (વેબ ટેકનોલોજી)	1				40	2			40				
7	BRIDGE COURSE-3	System Analysis and Design (પ્રણાલીનું વિશ્લેષણ અને અભિકલ્પના)	1				40	2			40				
8	COMPL-101	Gramjivan Padyatra (ગ્રામજીવન પદયાત્રા)				2									100
9	COMPL-102	Mannual Work (UDHYOG) (ઉદ્યોગ)				2									100
10		Community Living (સમૂહજીવન)				Grade					Grade				Grade

નોંધ: ૧. કમ્પ્યુટર વિષય સિવાયનાં સ્નાતકોએ BRIDGE COURSE-1, BRIDGE COURSE-2, અને BRIDGE COURSE-3 વિષયમાં પાસ થવું ફરજીયાત છે.

૨. જે વિષયમાં પ્રાયોગિક છે તે દરેક વિષયનાં સૈદ્ધાંતિક તથા પ્રાયોગિક બન્ને પ્રશ્નપત્રમાં પાસ થવું ફરજીયાત છે.

૩. સતત મૂલ્યાંકન એ આંતરીક મૂલ્યાકનનો એક ભાગ છે.

MCA SEMESTER - I
(Effective from Academic Year – 2023-24)

Course Code	**MCA-101**		
Course Name	**OBJECT ORIENTED PROGRAMMING USING JAVA** ઓબ્જેક્ટ ઓરીએન્ટેડ પ્રોગ્રામીંગ યુસીંગ જાવા		
Credits	Lecture : **4**	Tutorial : **0**	Practical: **2**
Prerequisite	Fundamentals of Programming and Knowledge of Any Programming language		
Course Objective	- This course is designed to give exposure to basic concepts of object-oriented technology. - This course will help in learning to write programs in Java using object-oriented paradigm. - Approach in this course is to take Java as a language that is used as a primary tool in many different areas of programming work.		
Total Number of Lectures	60		

Lectures with Breakup	**Number of Lectures**
Unit 1: **Object Oriented Technology & Java Language Basic** Paradigm of programming languages, Evolution of Object-Oriented Technology **Java Basic**: Introduction to Java Features & Advantages, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Understanding PATH and CLASSPATH, Important Java Packages (Java library), Java tools **Array and String**: Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Wrapper classes. **Class Fundaments (Syntax and semantics), Objects and Methods**: Class, Object, Object reference, Constructor, Constructor Overloading, Method and Method Overloading, Recursion, Passing and Returning primitive types and object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.	15
Unit 2: **Inheritance and Polymorphism:** Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords, Interface - Creation and Implementation of an interface, Interface reference, interface inheritance, Dynamic method dispatch, Understanding of Java Object Class, Comparison between Abstract Class, and Interface. **Package:** Use of Package, CLASSPATH, Import statement, Static import, Access control	15

Exception Handling: Exception and Error, use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class	
Unit 3: **Multi-Threading and Multithreaded Programming**: An Introduction, Use of Multithread programming, The Main Thread. Java Thread Model, Thread class and Runnable interface, Thread priority, Thread synchronization, Thread communication, Deadlock **Java Streams and Input/Output** : Introduction to Stream, Byte Stream, Character Stream, Readers and Writers, File Class, File Input Stream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader, Console Reading, and Writing	15
Unit 4: **Database Handling using JDBC:** Java Database Connectivity, Driver, Driver Types, DriverManager, Connection, Statement, Prepared Statement, Callable Statement, ResultSet, Result set metadata. **Generic:** Generic Introduction, Using Generics in Arguments and Return Types, Generic Methods, Defining Your Own Generic Classes, Generic Interfaces **Collection Framework:** Introduction to Java.util package and Collection Framework, Goals and Advantages of Collection Framework, Basic types of collections classes – ArrayList, LinkedList, Iterator, Enumeration, Vector, Stack	15

Laboratory Work:
• Implementation of algorithms studied about Stack, Queue, Linked List, Tree, Sorting and Searching

Course Outcome:
After Completion of course, students would be able to:
- Explain object-oriented programming concepts and implement them in java. - Comprehend building blocks of OOPs language, define class and object; explain the concept of abstraction and encapsulation. Describes strength of Java language - Explain the concepts of Inheritance, Polymorphism, method overloading and overriding, interface, and package and implements it in java. - Demonstrate exception handling mechanism, demonstrate use of I/O package. - Implement multithreading in object-oriented program. - Develop programs using JDBC, Java Collection framework.

Text Books:

1. Java Fundamentals A comprehensive introduction By Herbert Schildt, Dale Skrien, McGraw Hill Education.

Reference Books:

1. Object-Oriented Modeling AND DESIGN, JAMES RUMBAUGH, MICHAEL BLAHA; Publication - PHI.
2. Object Oriented Software Engineering, Yogesh Shing; Publication – PHI.
3. Beginning Java Objects from Concepts to Code, 2nd Edition, Jacquie Barker; Publication – A Press.
4. Programming with Java A Primer – E. Balaguruswamy, Mc Graw Hill
5. The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, - TMH.
6. Core Java Volume-I Fundamentals Horstmann & Cornell, - Pearson Education. - Eight Edition

********** END of MCA -101 **********

MCA SEMESTER - I
(Effective from Academic Year – 2023-24)

Course Code	**MCA-102**		
Course Name	**Data Structure** ડેટા સ્ટ્રક્ચર		
Credits	Lecture : **4**	Tutorial : **0**	Practical: **2**
Prerequisite	Knowledge of programming language like C, C++ etc.		
Course Objective	- To develop proficiency in the specification, representation and implementation of Data types and Data Structures - To perform various operation like insert, update, search and sorting on various data structures - To carry out the Analysis of various Algorithms for mainly Time and Space Complexity - To get a good understanding of applications of various Data Structures		
Total Number of Lectures	60		

Lectures with Breakup	**Number of Lectures**
Unit 1: **Introduction to Data Structure** o Data Management concepts o Data types – primitive and non-primitive o Types of Data Structures- Linear & Non Linear Data Structures. **Linear Data Structure:** • **Array** o Single dimensional & its addressing function o Multidimensional: two & three dimensional o Row major & column major representation & addressing functions • **Stack** o Definition & Concept o Operations on stack o Applications of Stacks - Conversion from infix to postfix • **Queue** o Definition & Concepts o Operations on queue o Types of queue- Circular queue o Applications of queue - Priority queue, Process queue • **Linked Linear List** o Singly linked list and operations on it o Double linked list and operations on it o Circular linked list and operations on it o Comparison of sequential & linked allocation, their advantages and disadvantages o Applications of linked list- Linked implementation of stack & queue	20

Unit 2: **Non-Linear Data Structure:** • **Binary tree** o Definition and Concepts o Representation o Operation Like Traversals : inorder, preorder, postorder, Insertion, Deletion, Copy, Searching o Sequential representation of binary tree • **Some balanced tree mechanism (Theory)** o Binary search tree, AVL tree, B tree o Height Balance - Weight Balance • **Graph** o Matrix representation of graph o Adjacency matrix o Path matrix o WARSHALL'S algorithm o MINIMAL algorithm o Adjacency list representation of graph o Operations on Graph - Breadth First Search, Depth First Search • **Multilinked structure** o Sparse matrix o Sequential & linked allocation of sparse matrix o Matrix addition using multilinked structure • **Dynamic storage management** o Fixed block storage allocation o First-fit storage allocation	25
Unit 3: • **Sorting methods** o Bubble Sort o Insertion Sort o Quick sort (Partition Exchange sort) o Radix sort o Heap sort o Performance comparison of sorting methods • **Searching** o Linear (sequential Search) o Binary Searching o Comparison of linear & binary searching • **Hashing techniques** o The symbol table o Hashing Functions o Collision Resolution Techniques	15

Laboratory Work:
• Implementation of algorithms studied about Stack, Queue, Linked List, Tree, Sorting and Searching

Course Outcome:
After Completion of course, students would be able to:
- Students will get familiar with fundamental data structure, its implementation and algorithm writing - Students will be able to decide a data structure to model any data used in computer applications - Students will be able to assess efficacy tradeoffs among different data structure implementation

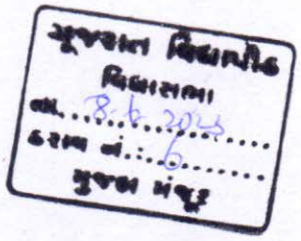
Text Books:

1. An introduction to Data Structures with applications by Tremblay & Sorenson, Tata McGraw Hill.
2. Data Structures by Tanenbaum.

Reference Books:

1. Introduction to Data Structure and algorithm with C By Glenn W. Rowe.
2. Fundamentals of Data Structures in C by Horowitz, Sahni, Anderson-Freed.

********** END of MCA -102 **********



Department of Computer Science
Gujarat Vidyapith, Ahmedabad – 14

MCA - SEMESTER - I
(Effective from Academic Year 2021-22)

Course Code	MCA-103		
Course Name	Mathematical and Statistical Computing with Python		
Credits	Lecture : 3	Tutorial : 0	Practical: 2
Prerequisite	Fundamental knowledge of any programing language		
Course Objective	- Fundamental knowledge of statistics and mathematics provides a strong foundation for learning in the field of data science, data analytics and machine learning. - This course emphasis on descriptive statistics, probability distribution and to teach more advanced concepts such as Bayes' theorem. - Course also explore and explain various kinds of probability and statistical distributions, visualization, Interpretation and its practical implementation using python programming language. - The course covers the prerequisite topics for machine learning like linear algebra, derivatives & its application and matrix decomposition of mathematics - To explore and analyze many different types of data. This course cover, basics of python programming language, OOPs concepts and its important libraries for exploratory data analysis and data visualizations.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: **Introduction** Introduction to Statistics and Statistical Methods, Descriptive and Inferential Statistics, Data Sources and Types of Datasets, Attributes of Datasets **Measures of Data** Raw Data, Frequency Distribution -Histograms, Cumulative Frequency Distribution, Measures of Central Tendency, Measures of Dispersion Normal distribution, five number summary, boxplots, scatter plot, Correlation analysis **Probability and Distributions** Introduction, Permutation combination, Basic Concepts, Event and random event, Mutual exclusive event, Independent event, Sample space, Random variable, Rules for Computing Probability, Marginal Probability, Conditional Probability, Bayes' Theorem, Normal Distribution	10

Unit 2: **Linear Algebra** Vector Spaces, Systems of Linear Equations, Matrices, Linear combination **Derivatives & Its Application** Introduction to Derivatives, Derivatives Rules, First order and 2nd Order Derivatives Partial derivatives, **Matrix Decompositions** Determinant and Trace, Eigenvalues and Eigenvectors	8
Unit 3: **Getting Started with Python** Introduction to Python, Variables and print statement, Numbers, Strings, Lists, Dictionaries, Tuples, Set, Arithmetic Operators, Comparison Operators, Logical Operators, Assignment and Bitwise Operators, Membership Operators, Identity Operators **Handling Program flow** If-elif-else Statement, while Loop, for Loop, Loop Control Statements, Continue, Break, Pass **File handling** Opening and Closing Files, File I/O Operations **Error & Exception Handling** Introduction to error & exception, Raising Exceptions, Exception Handling , Else and finally Clauses **Functions** Introduction to Function, built in and User define function , Scoping, Lambda Functions, Module , Package, Working with Higher Order Functions **Object Oriented Programming** Introduction to OOP in Python, Defining and Using Classes, Class attributes, Class Decorators, Inspecting and Object, Overriding Magic Methods	15
Unit 4: **Manipulating Data with Numpy** Introduction to Numpy Library, Important Array Features, Creating array with Low-level ndarray, Creating array with Existing Data, Creating array with Numerical Ranges, Indexing and Slicing, Vectorization, NumPy Arrays over Lists, Solving System of Equations with NumPy. **Data wrangling with Pandas** Introduction to Pandas, Pandas Series, Accessing Data in a Series, Pandas Data	12

Frame, Creating Data Frames, Quick Exploration of Data Selection, Creation, and Deletion, Cleaning the Data, Exploring Categorical Data, Exploring Numerical Columns. **Introduction to Matplotlib, seaborn** Bar-chart and Anatomy of a Plot, Line Plots and Plot Customizations, Stacked Bar Chart, Histogram, Scatter Plot, Drawing Multiple Plots	

Self-Study:
UGC Swayam Portal(Swayam Central) , e-PGPathsala(e-PGPathshala (inflibnet.ac.in))

Laboratory Work:
Python Practical Based on theoretical topics

Course Outcome:
After Completion of course, students would be:
- Understand the different types of Data and able to find out various statistical measures from data. - Express the concept of probability, its features and definitions. - Explain the concept of a random variable and various events. - Understand the problem in hand, define the sample space and calculate probabilities using Conditional probability, Rule of total probability and Bayes' theorem. - Understand and solve the problem of linear algebra and matrix. - Find out the first and second derivatives of problem in hand. - Perform matrix decomposition and find out the eigenvalues and eigenvector of given matrix. - Explain OOP concepts, principles, design patterns and methods; - Write a python program and functions independently - Understand and use important libraries like NumPy, Pandas, matplotlib and seaborn. - Perform Exploratory Data Analysis and create meaningful data visualizations using python.

Books:

1. Statistics Made Easy by Prof. Dr. Hamid Al-Oklah Dr. Said Titi Mr. Tareq Alodat, 2nd edition.
2. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong.

E-Book

1. Scientific and Mathematical Computing Using Python.

Web Resource

1. Statistics for Machine Learning www.greatlearning.in
2. Computational Statistics in Python — Computational Statistics in Python 0.1 documentation (duke.edu)
3. "Lectures on Mathematical Computing with Python" by Jay Gopalakrishnan (pdx.edu) Publisher Portland State University Library
4. Mathematical Python (ubc.ca)(https://www.math.ubc.ca/~pwalls/math-python/)
5. https://www.freecodecamp.org/news/the-python-handbook/
6. https://www.freecodecamp.org/learn/data-analysis-with-python/data-analysis-with-python-course/introduction-to-data-analysis

Additional Resources

1. Mathematical notes — Python Hacks - Scientific/financial Computing using Python (bruunisejs.dk)

Gujarat Vidyapith
Department of Computer Sc.
(Faculty of Management and Technology)

MCA - SEMESTER – I
MCA-104: Database Management System
ડેટાબેઝ મેનેજમેન્ટ સિસ્ટમ

(Effective from - 2020)

Credits	**3 + 1**
Objective and **Course Outcome**	Understand architecture of DBMS, Design database, table and attributes. Normalization of table is important part for that. This part of the paper also covers concurrency problems and its solution. Use knowledge practically in SQL. After learning the course, the students should be able to: 8. Understand database management system architecture. 9. Create and manage database with all integrity constraints. 10. Refine the scheme of database by applying normal forms. 11. Recover the database from failures from concurrency problems. 12. Create views, procedures and triggers on databases.
Prerequisite	Knowledge of data storing using File and file system implementation.

UNIT - I **1 CREDIT**

Architecture of DBMS

- The Three Levels of the Architecture
- The External Level
- The Conceptual Level
- The Internal Level
- Mappings
- The Database Administrator
- The Database Management System
- Candidate Keys, Primary Keys, Alternate Keys, Foreign Keys
- ER Diagram

UNIT - II **0.5 CREDIT**

Database table Normalization

- Non-loss Decomposition and Functional Dependencies
- First, Second, Third, Fourth and Fifth Normal Forms
- Dependency Preservation
- Boyce/Codd Normal Form

UNIT - III **1 CREDIT**

Two-Phase Commit, Concurrency Problems, Locking and Isolation

- Two-Phase Commit, SOL Support
- Three Concurrency Problems
- Locking
- The Three Concurrency Problems Revisited
- Deadlock,
- Serializability,
- Level of Isolation,

- Intent Locking

UNIT - IV **0.5 CREDIT**

SQL

- Database creation & management
- Table creation and management
- Query on tables (select, insert, delete, update statement)
- Triggers

LABORATORY WORK - PRACTICAL **1 CREDIT**

LAB - MCA - 104 SQL

Book(s):

1. An Introduction to Database Systems by C.J.Date, A. Kannan, S. Swamynathan Publisher Pearson, 8th edition

Reference Book(s):

1. An Introduction to Database Management System By - Bipin Desai, Publisher PHI, Edition second
2. Database System Concepts By - Avi Silberschatz, Henry Korth, S.Sudarshan,Publisher McGrow-Hill, Edition 5th.

********** END of MCA -104 **********

Gujarat Vidyapith
Department of Computer Sc.
(Faculty of Management and Technology)

MCA SEMESTER - I
BRIDGE COURSE – I

PROGRAMMING LANGUAGE ("C")

સંક્રમાદેશ ભાષા ("સી")

(Effective from - 2020)

Hours	15
Objective	Understand how to develop logic for computer programming. It includes iterative programming and other programming methods. This part of the paper also covers topics like input-output, control statements, control loops, structure and pointers,
Prerequisite	No prerequisite for this paper

UNIT - I

- Logic development using flowchart
- Iterative methods for developing algorithms/flowcharts
- An Introduction to declarations, Assignments & variables.
- Making decision in C
  - If else statement
- Control loops
  - While loop
  - do while loop
  - for loop
- scanf & printf functions.
- Continue and break Statement
- User defined functions.
- array
- Strings

Practical

LAB - INTRODUCTION TO PROGRAMMING ("C")

Book(s):

1. The Let us C, by Yashwant Karnitkar, Publisher Infinity Science Press; 8th Revised edition

Reference Book(s):

1. The C Programming language By Ritchie and Kernighan Publisher PHI, Edition second
2. C How to program By Deitel and Deitel, Publisher Prentice Hall
3. Introduction to C Programming by Reema Thareja Publisher Oxford university press

********** END of Bridge Course - I **********

Gujarat Vidyapith
Department of Computer Sc.
(Faculty of Management and Technology)
MCA SEMESTER - I
BRIDGE COURSE- II

Web Technology

વેબ ટેકનોલોજી

(Effective from - 2020)

Hours	**15**
Objective	A bridge course for students who are from non-computer field.
Prerequisite	Basic knowledge of working with computers

UNIT - I

- **HTML**
  - Basics of HTML, formatting and fonts, commenting code,
  - Color, hyperlink, lists, tables, images, forms,
  - Frames and frame sets.
- **CSS**
  - Need for CSS, introduction to CSS,
  - Basic syntax and structure, using CSS,
  - Background images, colors and properties
  - Manipulating texts, using fonts, borders and boxes, margins
  - Padding lists, Animations

- **JavaScript**
  - Client side scripting with JavaScript
  - Variables, functions
  - Conditions, loops and repetition,
  - Pop up boxes,

Reference Books:-

- Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
- Web Enabled Commercial Application Development Using Html, Javascsript, Dhtml & Php by Ivan Bayross

Web Resources:-

- http://www.w3schools.com/

Course Outcome:-

After Completion of this course students will be able to

1. List various HTML tags and use them to develop user friendly web pages
2. Define the CSS with its types and use them to provide the styles to the web pages at various levels
3. Use the JavaScript to develop the dynamic web pages

********** END of Bridge Course – II **********

Gujarat Vidyapith
Department of Computer Sc.
(Faculty of Management and Technology)

MCA SEMESTER - I
BRIDGE COURSE – III

SYSTEM ANALYSIS AND DESIGN

પ્રણાલીનું વિશ્લેષણ અને અભિકલ્પના

(Effective from - 2020)

Hours	**15**
Objective	The student will be able to use System Analysis and Design models and techniques to determine and specify software requirements and can develop software and Information Technology architecture for any type of organization.

UNIT - I

- **Project Management**
  - Project Plan
  - Managing Project
  - Estimation
- **System Analysis**
  - Requirements Determination
  - Techniques
  - Feasibility Analysis
  - Hardware and Software Requirements
- **System Design**
  - Data Flow Diagram
  - Data Dictionary
  - Design of Input and Output
  - Cohesion
  - Coupling
- **System Testing**
  - About Software Testing
  - Software Verification Techniques
  - Checklist
  - State based Testing
  - Design of Test Cases

Text Book:

- Analysis and Design of Information Systems by James A. Senn Publisher: McGraw Hill
- System Analysis and Design by Dennis, Wixom and Roth Publisher: Wiley

********** END of Bridge Course – III **********

MCA
Semester-II
Syllabus
Effective
from
June-2021

Teaching & Evaluation Scheme

Name of Program: Master in Computer Application (MCA Semester-II)

Effective from Academic Year-2021-22

Sr. No.	Subject Code	Elective	Name of the Subject	Teaching Hours / Week				Evaluation Scheme / Semester								
				Th	Tu	Pr	Credit Total	Theory					Practical (Marks)			Total
								Internal Exam		University Exam		Theory Total	Internal Practical/ Viva Exam*	University Practical Exam	Practical Total	
								Marks	Hrs	Marks	Hrs					
1	MCA-201	Elective-I	Operating System (ચાલક પધ્ધતિની તંત્રરચના)	3		4	3+2	40	2	60	2½	100	40	60	100	200
		Elective-II	SQL for Data Science (SQL ફોર ડેટા સાયન્સ)													
		Elective-III	Mobile Application Development (મોબાઈલ એપ્લિકેશન ડેવલપમેન્ટ)													
2	MCA-202		Web Technology (વેબ ટેકનોલોજી)	3		4	3+2	40	2	60	2½	100	40	60	100	200
3	MCA-203		Computer Network (કોમ્પ્યુટર આંતરજોડાણ વ્યવસ્થા)	4			4	40	2	60	2½	100				100
4	MCA-204		Software Design Pattern (GOF) (સોફ્ટવેર ડીઝાઇન પેટર્ન (GOF))	3		4	3+2	40	2	60	2½	100	40	60	100	200
5	MCA-205		Software Engineering (સોફ્ટવેર ઇજનેરી)	3	1		4	40	2	60	2½	100				100
7	COMPL-202		Mannual Work (UDHYOG) (ઉદ્યોગ)				2									100
8			Community Living (સમૂહજીવન)				Grade					Grade				Grade

નોંધ: ૧. જે વિષયમાં પ્રાયોગિક છે તે દરેક વિષયનાં સૈદ્ધાંતિક તથા પ્રાયોગિક બન્ને પ્રશ્નપત્રમાં પાસ થવું ફરજીયાત છે. ૨. સતત મૂલ્યાંકન એ આંતરીક મૂલ્યાકનનો એક ભાગ છે.

* MCA-206 Removed

Department of Computer Science
Faculty of Management and Technology
Gujarat Vidyapith, Ahmedabad – 14

MCA SEMESTER - IV
MCA-201: OPERATING SYSTEMS (Elective-I)
ચાલક પધ્ધતિની તંત્રરચના

(Effective from JUNE – 2020-21)

Credits:	Theory- 3 + Practical - 2
Objective:	• This subject accomplishes file management, device management, and process & resource management. Student get knowledge of hardware interface with software that can be run to handle all devices, resources primary storage and secondary storage. Process creation and management in the system with scheduling all on the processor and resource handling for a process.
Prerequisite:	• Knowledge of computer hardware • Basic operation of operating system • Basic data structure algorithms and programming..
Learning Outcome:	• Student will able to understand primary and secondary storage management o File and directory creation and dynamic handling of it using file system data structure o Allocation on primary and secondary storage o System calls that interact with hardware through file system o Security of the file system • Student will learn about device management and various file system calls o Device access and mount with the system using device drivers o Change in the access while device/ file system is changed o Swap device / virtual memory management on the secondary storage o Will work on system level calls like, open, creat, pipe, dup, etc. with changes in the file system data structure. • Student will understand about process o Creation of process and its life with various resources using process sub system data structure o Different states of the process and its transition o Context of the process and context switch with sleep and wakeup system call o Growth of the process, loading a process, expansion and shrink of the process etc. • Student will learn about scheduling algorithms for system and IPC o Scheduling algorithms with reference to time, age, priority and address

	○ Exec to incorporate other program and handling page fault • Inter Process Communication through Signal, Message queue and Semaphore

UNIT - I **CREDIT-1**

Introduction to Operating System and File Structure

- General overview of the system,
- System Structure, User Perspective
- Operating System Services
- Assumptions about Hardware
- Introduction to the kernel
- Architecture of the Operating System
- Introduction to the system concepts
- Kernel Data Structures
- System Administration
- Internal Representation of Files
- Structure of a Regular File
- Directories, Conversion of a path name
- Super Block
- Creation of a new file
- Allocation of Disk Blocks
- Other File Types

UNIT -II **CREDIT-0.5**

File System Calls and Process Sub System

- System Calls for the File System (without algorithm)
  - ○ Open, Read, Write, File and Record Locking
  - ○ Close, File Creation, Change Directory and Change Root
  - ○ Change Owner and Changing Mode
- The structure process
- Process states and transitions
- Layout of system memory
- The context of a process
- Saving the context of a process
- Manipulation of the process address space
- Sleep

UNIT - III **CREDIT-1**

Control of the process

- Process Control
- Process Creation
- Signals
- Process termination
- Awaiting process termination
- Invoking other programs
- The user ID of a process
- Changing the size of a process
- The shell
- System Boot
- The INIT process

Unit – IV **CREDIT-0.5**

Process Scheduling and Memory Management

- Process scheduling and time
- Process scheduling
- System calls for time
- Memory Communication

LABORATORY WORK - PRACTICAL **CREDIT-2**

LAB – SHELL SCRIPTING

BASH SHELL WITH LINUX/UNIX ENVIRONMNET

LAB – PROCESS PROGRAMMING

GCC/ CC COMPILER WITH LINUX/UNIX ENVIRONMENT

List of Experiments:-

1. Sharing file data between processes
2. show the difference when you are using low level I/O function and high level I/O function
3. show the value of environment variable after fork
4. List out how many user currently login with Unix system and display their details
5. write a program to handle illegal instruction execution
6. implement sorting using pipe
7. display the result of "who" command in total no of words by using pipe

8. implement two pipes using parent and child process
9. create semaphore thro C program
   get the value of semaphore and set the value of semaphore
10. Create one message queue and display its property using proper structure
11. Send and receive message using message queue.
12. List out how many user currently login with Unix system and display their details
13. write a program to handle the child process and parent process (when they terminate indicate by proper function)
14. Write a program to display all the files from given directory.(display file only if it is ascii) , if directory is not passed as argument then display from current dir. Accept filename as command line argument & display its permissions for read , write or execute otherwise display appropriate messages.

15. Write a shell script which recursively delete *.obj , *.lst or all files with length of zero bytes
16. Write a shell script which concatenate all given files into a single file. Put filename before every file.
    e.g. *** filename : xyz ***
17. Write a shell script for printing calender for the month that entered as a char argument

18. Write a shell script to generate following output.

Mon Aug 24 09:30:31 EST 1998

Date is .....: 24-08-98

Date is .....: 08/24/98

Time is .....: 09 - 30 -31

Time is .....: 09:30:31

No of days elapsed in this year is : 234

Serial no of day (of week) is : 31

Day and Date is.....: Tue Aug 24, 1998

Time in the form AM/PM .....: 09:30:31 AM

Good Morning

19.write a shell script to copy a duplicate file from two directory to third directory and remove both the old files. Pass names of the directory as command line argument.

20.Create a data file containing following fields each separated by ':'

bk_cd,bk_name,bk_category,bk_author,publisher,pur_dt

1. display the book name and category for books other than in category 'fiction'

2. display the duplicate lines in the file.

3. count the number of lines after the tenth line in the file.

4. provide insert,delete,update and display options.

21.Write a program to display all the files from given directory.(display file only if it is ascii)

if directory is not passed as argument then display from current dir.

22. Write a shell script to find the sum of first n numbers , where n is accepted from the user.

1+2+3...n

23. write a shell script that accept an option number , and the names of two files as command line arguments . Depending on the option the following option should be taken.

option no	action
1	copy first file to second file
2	concatenate the files
3	rename 1st file as 2nd file
4	display no. of lines in both the files.

Text Book(s):

1. The design of Unix Operating system, By Morris Bache, PHI
2. The C Odysse, Meeta Gandhi, Tilak Shetty, Rajiv Shah, BPB

Reference Book(s):

1. Operating system: concept and Design, by Milan Milenkovic, McGrowHill
2. Modern Operating system by Andew Tanenbaum, Pearson

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MCA SEMESTER - II
MCA – 201 : SQL for Data Science (Elective-II)
SQL ફોર ડેટા સાયન્સ
(Effective from JUNE – 2020-21)

Credits:	Theory - 3 + Practical - 2
Objective:	• To give a primer in the fundamentals of SQL and working with data so that student can begin analyzing it for data science purposes • Student will begin to ask the right questions and come up with good answers to deliver valuable insights for organization • To enable student to gradually write both simple and complex queries to select data from tables • Student will start to work with different types of data like strings and numbers and discuss methods to filter and pare down results
Prerequisite:	• Student should have basic knowledge of DBMS concepts
Learning Outcome:	The students will: • Create new tables and be able to move data into them • Learn common operators and how to combine the data • Use case statements and concepts like data governance and profiling • Interpret the structure, meaning and relationships in source data and use SQL as a professional to organize data for targeted analysis purposes • Identify a subset of data needed from a column or set of columns and write a SQL query to limit to those results • Use SQL commands to filter, sort and summarize data • Manipulate strings, dates & numeric data using functions to integrate data from different sources into fields with the correct format for analysis

UNIT - I **CREDIT-0.5**

Understanding the Data Model with SQL & NoSQL

- Understand data and types of Data, The Evolution of Data Models, Relational (SQL & NOSQL) vs. Transactional Models, Understanding the Information Schema Table of SQL, NoSQL: History, Feature, Types of NoSQL Database, Advantages and Disadvantages of

NoSQL. Retrieving, updating & deleting data in database, applying comments and using wildcards in SQL

UNIT -II **CREDIT-01**

Filtering, Sorting for Data Preparation and Calculating Data with SQL & NoSQL

- SQL Filtering, Slicing Data, Data Sorting and Mathematical Calculation Operations, Data Grouping and apply Aggregate Functions using SQL concepts, Query Optimization

UNIT - III **CREDIT-01**

Cleaning and Transforming Data with SQL

- Cleaning Data in SQL, Different data types and messy values, Undesired type, Type mismatch & COALESCE, Cleaning and setting numeric values for analysis, Messy Strings, Cleaning String Values, String formulation of messy date & time values for analysis, Removing duplicate data,
- Transforming data

UNIT - IV **CREDIT-0.5**

Modifying and Analyzing Data with SQL

- Data visualization using SQL Pivot, Query Execution Plan, Views, Data visualization tools, Database or Table Data Exporting into SQL/CSV & Importing from SQL/CSV, Data Governance and Profiling

LABORATORY WORK - PRACTICAL **CREDIT-02**

LAB – SQL

List of Experiments:

- Implementation of SQL Queries on tables of various size and type to retrieve data.

Text Book(s):-

1. SQL Queries for Mere Mortals, Fourth Edition, A Hands-On Guide to Data Manipulation in SQL by John L. Viescas, Addison- Wesley, Pearson Education, Inc.

Reference Book(s):-

1. Data Analysis Using SQL and Excel by Gordon S. Linoff published by John Wiley & Sons, Inc., second edition, ISBN: 978-1-119-02143-8
2. SQL for Data Analytics by Upom Malik, Matt Goldwasser and Benjamin Johnston published by Packt Publishing Limited 2019 edition, ISBN-978-1-78980-735-6.
3. Solving Business Problems Using SQL: A Definitive Guide for Beginners Who Want to Be Proficient in Database Design and Writing SQL. Published by Hafizur Rahman, 2019 edition. ISBN: 9781795478298.

List of Software / Learning Websites

- MYSQL Workbench

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MCA – SEMESTER - II
(Effective from Academic Year - 2021-22)

Course Code	MCA-201		
Course Name	Mobile Application Development		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite	- Knowledge of the Core Java Programming concepts is must. - Knowledge of database concepts is must.		
Course Objective	- Understand the process of developing software for the mobile - Create mobile applications on the Android Platform - Student will be able to develop Android user interfaces - Create mobile applications involving data storage in SQLite database. - Understand the Android API network, web, Telephony.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Android Application Design Essentials • Anatomy of an Android applications • Application Context, Activities, Services, Intents **Android Application Design Essentials** • Receiving and Broadcasting Intents • Android Manifest File and its common settings • Using Intent Filter, Permissions • Managing Application resources in a hierarchy • Working with different types of resources	15
Unit 2: Android User Interface Design Essentials • User Interface Screen elements • Designing User Interfaces with Layouts • Drawing and Working with Animation	8
Unit 3: Using Common Android APIs • Using Android Data and Storage APIs • Managing data using SQLite • Webservice (SOAP and REST), REST Webservice creation and utilization of webservice in Android Application	7

Unit 4: Using Common Android APIs • Sharing Data Between Applications with Content Providers • Android Networking APIs • Android Web APIs • Android Telephony APIs • Google MAP in Android application • Accessing Android's Hardware Sensors (orientation sensors, light sensors)	05

Laboratory Work:
Mobile Computing Practical- Eclipse Mobile edition will be allowed to be used as an IDE

Course Outcome:
After Completion of course, students would be:
- After Completion of course, students would be: - Analyse and design the simple class and object modelling. - Identify and understand the different issues of software architecture - Identify the appropriate design patterns to solve the issues of software architecture - Develop the design solutions using the creational, structural and the behaviour patterns

Text Books:

1. Android Wireless Application Development by Lauren Darcey and Shane Conder, 3rd Edition, Pearson Education.

Reference Book(s):

1. Professional Android 2 Application Development by Reto Meier, Wiley India Pvt Ltd, 2011.
2. Beginning Android by Mark L Murphy, Wiley India Pvt Ltd, 2009.
3. Pro Android by Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, 2009.

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MCA - SEMESTER - II
MCA – 202 : Web Technology
વેબ ટેકનોલોજી

(Effective from JUNE – 2020-2021)

Credits:	Theory- 3 + Practical -2
Rationale:	• This course introduces client-side and server-side web scripting and dynamic web application development. Students develop various web applications and gain knowledge of current and emerging technologies and practices. Students will examine core aspects of web technologies and web applications and will develop usable websites. Independent research on an assigned topic is also required.
Objective:	• To explain different components of dynamic web application (DOM, CSS, DHTML-client-side and Script and server-side scripting, XML). • Design and develop websites using fundamental web languages, technologies, and tools. • Distinguish between server-side and client-side web technologies. • Acquire knowledge and skills for creation of server-side dynamic web application and practical aspects of web application development using java server-side programming language (Servlet, JSP (Java Server Pages), JavaBeans, JDBC, and XML). This course concepts learn via theory and hands-on sessions.
Course Outcome:	At the completion of the course, students should be able to: • Identify the appropriate programming environment for developing dynamic client-side and server-side web applications. • Plan, develop, and implement interactive client-side and server-side web applications and deploy it on web server. • Describe the architecture of client-side and server-side web applications. • Identify the tools needed to create dynamic web applications for Java Server programming using Servlet/JSP to generate the web pages. • Develop a dynamic webpage using Java server-side programming. • Write a server-side java application called Servlet to catch form data sent from client, process it, and store it on database. • Write a server-side java application called JSP to catch form data sent from client and store it on database. • Write a well-formed / valid XML document.
Prerequisite:	Student should have basic knowledge of HTML, CSS Java Script, Fundamental of Java Programming, SQL, JDBC and Database concepts.

UNIT - I **CREDIT- 1**

Web Concepts, DHTML and Java Editions:

Overview of the Internet, Web as a platform and its components. Form processing at the client side. DHTML and its components. Dynamic page using DOM, CSS, and Java Script.

Introduction to Request – Response Architecture, Web application and HTTP Protocol, Tomcat application server and its structure, Java Web Application Architecture, Understanding HTTP Status Codes, HTTP Request ad Response Headers, Overview of Java Editions.

Servlet API and Overview:

Servlet Model: Servlet: What and Why? Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor, Comparison with existing technologies, Servlet Interface, Servlet Context and Servlet Config interface, Generic Servlet, Http Servlet, Steps to create a Java web application in Tomcat, Handling Client Request- Reading Request Headers, reading request data in Servlet and Generate dynamic content/response. Request Redirection and Dispatching, Servlet- catch form data sent from client, process it, and store it on database. JDBC (Java Database Connectivity) and how it can be used within servlet.

UNIT -II **CREDIT- 1**

Session Tracking and Management:
Session Tracking: What and Why? Understanding Session Timeout and Session Tracking - Hidden Form Field, URL Rewriting, Cookies, HTTP Session

Handling Cookies: Create Cookie, remember user data, Deleting Cookies, Sending and Receiving Cookies, Differentiating Session Cookies from Persistent Cookies, Using Cookies to Remember User Preferences.
Session Tracking and Management: Session Tracking using HTTP Session APIs, Encoding URLs, Sent to the Client and accumulating a List of User Data.

Java Server Pages (JSP):

The Problem with Servlets, Overview of JSP, Advantages of JSP, JSP Comment, Life Cycle of JSP page, JSP API, JSP Expression, JSP Scriptlet, JSP Declaration, JSP Directives, JSP Standard Action, JSP implicit Objects, JSP Directive, JSP Scripting elements, JSP Action Elements: jsp:forward, jsp:include, jsp:useBean, jsp:setProperty & jsp:getProperty, Java Bean and JSP Communication, Exception Handling, JSP Session and Cookies Handling, JSP Session Tracking, JSP- catch form data sent from client, process it, and store it on database.

UNIT - III **CREDIT- 1**

MVC Application Design with Servlet/JSP:
Introduction to MVC, Advantages and Disadvantages of MVC Architecture JSP Application Design with MVC, MVC pattern Layer: Model, View and Controller. Role of Servlet and JSP in MVC.

Extensible Markup Language (XML):

XML Introduction and Overview, XML, Understanding the purpose and difference of HTML and XML, History and application of XML, XML Syntax, XML Document Structure and Building Blocks of XML Documents, XML Parsers, Well-formed and valid XML Documents, XML Namespace, Understating DOM, Types of Elements

Document Type Definition (DTD): Introduction to DTD, Purpose of DTD, Create Internal and External DTD, referencing a DTD in an XML Document, defining building blocks of XML documents - Elements, Attributes, Entities, PCDATA, CTADA, Declaring Elements, Attributes and Entity.

XML Schema: Introduction to XML Schema, Purpose of XML Schema, Advantages of XML Schema, Comparison with DTD, Understanding Why XML Schema is better than DTD, Create XML Schema Document (.XSD), Referencing a Schema in an XML Document, defining building blocks of XML documents using Schema, XML Schema Date Types, Understating use of Restriction, Occurrence, and Indicators with examples.

LABORATORY WORK - PRACTICAL **2 CREDIT**

LAB – MCA-202 Web Technology

List of Experiments:-

Practical list should be prepared based on the content of the subject with following guidelines in mind.

- Entire syllabus should be covered.
- Practical list should be designed with real life examples.
- List should be prepared to cover individual concepts and integration of different concepts on real life problems.

Text Book(s):-

- "Java Servlet Programming", by Jason Hunter, William Crawford, O'Reily Publication
- "Head First Servlets and JSP" by Bryan Basham, Kathy Sierra, Bert Bates, O'Reily Publication
- "Professional XML", by Mark Birbeck, Wrox Publication

Reference Book(s):-

- "Core Servlets and Java Server Pages" Volume – 2", Pearson Education

- "Java Server Programming", A Press Publication
- "Pro JSP 2" by Simon Brown, Sam Dalton, Daniel Jepp, David Johnson, Sing Li, and Matt Raible, Apress Publication
- "Web Technologies Black Book", Dreamtech Press, Edition 2010
- "Web Enabled Commercial Application Development Using HTML, DHTML, PERL, Java Script", by Ivan Bayross, BPB Publications, Revised Edition

List of Software / Learning Websites

- **Apache Tomcat**
  http://tomcat.apache.org
- JDBC Database Access
  https://docs.oracle.com/javase/tutorial/jdbc/
- **Servlet Technologies**
  http://www.oracle.com/technetwork/java/index-jsp-135475.html
- Java Server Pages
  http://www.oracle.com/technetwork/java/javaee/jsp/index.html
- **The Java EE Tutorial**
  https://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html
- **MySQL**
  https://dev.mysql.com/doc/

Teaching Belief/Philosophy and Practices

- Generate and sustain student interest.
- Maintain a balance on teaching and learning.
- Provide complete educational experience beyond classrooms and courses.

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MCA SEMESTER - II
MCA–203 : Computer Network
કમ્પ્યૂટર આંતરજોડાણવ્યવસ્થા
(Effective from JUNE – 2020-21)

Credits:	4
Objective:	• At the end of the course students should be able to work with computer network and manage the primary activities in communication of data across different geographical areas. • This has to be achieved by understanding networking protocols, standards and networking models, network configuration, understand the functionality of various layers in network protocol and network security.
Prerequisite:	• Basic knowledge of telecommunication and data communication system
Learning Outcome:	• After completion of this course the students will be able to explain the functions of each layer in the OSI model and TCP/IP model. • They can use and apply the fundamentals of data communication and networking to identify the requirements to establish computer network and can identify connecting devices utilized in computer network. • They can implement the concepts of IPv4 and IPv6 protocols and their characteristics and functionalities. • They can evaluate and implement routing algorithms and can implement transport and application layer protocols along with concepts of network security.

UNIT-I **CREDIT-I**

- **Introduction to Data Communication and Networking**
  - Need of Data Communication and Applications
  - Network Models
  - TCP/IP and OSI Layering Models
- **Physical Layer**
  - Transmission Media
  - Wired and Wireless Physical Layer
- **Data Link Layer – Error Detection and Correction**
  - Introduction and Duties of Data Link Layer
  - Types of Errors
  - Redundancy
  - Detection Versus Correction
  - Forward Error Correction Versus Retransmission
  - Error Detection
  - Error Correction
  - Block Coding

- Linear Block Codes
- Cyclic Codes

UNIT-II **CREDIT-I**

- **Data Link Layer – Data Link Control**
  - Data Link Control and Protocols
    - Flow and Error Control
      - Flow Control
      - Error Control
      - Flow and Error Control Mechanism
  - Noiseless Channels
  - Noisy Channels
  - Bluetooth
    - Architecture
    - Applications
    - Profiles
    - Pairing Process
- **Network Layer**
  - Introduction
  - Duties of Network Layer
    - Routing
    - Accounting
    - Global Machine Level addressing
  - Connection Oriented and Connectionless Forwarding
  - Forwarding Examples
  - Routing Algorithms
    - Distance Vector Routing
    - Link State Routing
    - Border Gateway Protocol
  - Congestion
    - Congestion Control
  - IPv4 Addresses
    - Address Space
    - Notations
    - Classful Addressing
    - Classless Addressing
  - Subnetting and Supernetting
  - IPv6 Addresses
    - Structure
    - Address Space
  - ICMP

UNIT-III **CREDIT-I**

- **Transport Layer**
  - Introduction
  - Duties of Transport Layer
    - Multiplexing, Demultiplexing and Port Numbers
    - Service to other Layers
    - Transport Layer of the Internet

- Process Level Addressing
- End to End Solutions

- Connection Management at the Transport Layer
  - Delayed Duplicates
  - Connection Establishment
  - Connection Release
- Congestion Control
  - Detecting Congestion
  - Reacting to Congestion
  - Fast Recovery
  - Flow Control
- Communication Primitives

UNIT-IV **CREDIT-I**

- **Application Layer**
  - Introduction
  - Domain Name System
    - Domain Name Space
    - Registration Process
    - Name Servers
    - Resource Records
  - Mailing System
    - SMTP
    - POP3 and IMAP
    - Webmail
  - SNMP
  - Network Protocol Analyzer
    - Wireshark
    - Applications
    - Features
- **Network Security**
  - Introduction
  - Cryptography
  - Digital Signatures
  - Public Key Management
  - Authentication Protocol
    - Authentication based on Shared Secret Key
  - Information Security

Text Book:-

- Title: Computer Networks by Bhushan Trivedi
  Publication: Oxford University Press

Reference Books:-

- Title: Data Communications and Networking by Forouzan
  Publication: McGraw Hill
- Title: Computer Networks by Tanenbaum
  Publication: Prentice Hall of India

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MCA – SEMESTER - II
(Effective from Academic Year -2021-22)

Course Code	MCA-204		
Course Name	Software Design Pattern (GOF)		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite	Basic concept of Object-oriented design and familiarity with programing language (Java, C++ or C#.NET)		
Course Objective	- This course will familiarize students with all fundamental and advance techniques of Object-Oriented Analysis design and modeling. - Understand the concept of Design patterns and its importance, - Able to use the language of patterns to find and to record solutions to recurring problems of system architecture. - Relate the Creational, Structural, behavioural Design patterns. - Apply the suitable design patterns to a recurring problem and refine the basic design for given context. - This course will lay the ground to implement these patterns in an Object-Oriented language like Java C++ or C# .NET.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1:Object Modeling Introduction to Object Orientation Analysis and Design, Object Oriented Development and Themes, Importance of Modelling, principles of modeling, Objects, Classes, Class Diagrams, Values and Attributes, Operations and Methods, Link and Association concepts -Links and Associations, Multiplicity, Association and Names, Ordering, Association Classes, Qualified Association, Generalization and Inheritance, Aggregation ,Abstract classes, Generalization as extension and Restriction, Grouping Constructs, Sample Object modelling	10
Unit 2: Design Patterns (GOF) Introduction to design Pattern, Describing design Patterns, The catalog of Design Patterns, selecting design pattern and solve design problems **Creational Patterns** Abstract factory, Factory Method, Singleton, Prototype	15
Unit 3: Structural Patterns Adapter, Decorator, Façade, Proxy **Behavioral Patterns** Chain of Responsibility Pattern, State, Strategy, Observer	15

Unit 4: Design Pattern in Java Core API, Case Study	05

Laboratory Work:
Practical Implementation of each pattern coved in theory using Java, C++ or any other OOP

Course Outcome:
After Completion of course, students would be:
- Analyse and design the simple class and object modelling. - Identify and understand the different issues of software architecture - Identify the appropriate design patterns to solve the issues of software architecture - Develop the design solutions using the creational, structural and the behaviour patterns.

Text Books:

1. Object – Oriented Modeling and Design by James Rumbaugh, Michael Blaha
2. Design Patterns Elements of Reusable Object-Oriented Software by Erich Gama, Richard Helm, Ralph Johnson, John Vlissides, Pearson Education

Reference Books :

1. Head First Object –Oriented Analysis & Design by Brett D. McLaughlin, Gary Pollice & David West, O'REiLLY
2. Head First Design Pattern by Eric Freeman & Elisabeth Freeman, O'REiLLY

Online Courses:

1. https://www.edulib.in//userLib/subjectTopics/553

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MCA - SEMESTER - II
(Effective from Academic Year – 2021-22)

Course Code	MCA-205		
Course Name	Software Engineering		
Credits	Lecture : 3	Tutorial : 1	Practical:
Prerequisite	Basic concepts of System Analysis and Design		
Course Objective	- Understand software development life cycles and various development models - Gain knowledge regarding design paradigms - Understand project management and quality management - Understand fundamental concepts of software testing methods and issues related to software testing - Identify various risks associated with software project		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Introduction to Software and Software Engineering The Evolving Role of Software, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Component-Based Development, Agility and Agile Process model, Extreme Programming **Requirement Analysis and Specification** Understanding the Requirement, Requirement Modelling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering	14
Unit 2: Software Design Design Concepts and Design Principal, Architectural Design, Component Level Design, User Interface Design, Web Application Design, Introduction to UML, UML Building Blocks, Modelling Views, Introduction to Use Case, Use Case Diagrams, State Diagrams, Sequence Diagrams, Activity Diagrams, Component Diagrams, Activity Diagrams, Packages and Foundation	14
Unit 3: Software Testing Testing Strategies, Testing Techniques, Test Cases, Testing Conventional Applications, Testing Object Oriented Applications **Software Project management** Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning, Project Scheduling & Tracking, Risk Analysis & Management **Software Quality management** Quality Concepts and Software Quality Assurance, Software Reviews (Formal	17

Technical Reviews), Software Reliability, The Quality Standards: ISO 9000, CMM, Six Sigma for SE, SQA Plan.	

Tutorial:
1. Consider any project to be developed in any technology as a Project Manager. Construct Software Requirement Specification (SRS) document for the project.
2. Software Project Management Tool

Course Outcome:
After Completion of course, students would be:
- Apply appropriate development model for software project. - Prepare SRS (Software Requirement Specification) document. - Apply the concept of Software Design. - Will be able to apply and ensure quality of software product. - Apply various testing techniques

Text Books:

1. Software Engineering – A Practitioner's Approach,
   Publication. McGraw-Hill International Edition
   Author. Roger S. Pressman (Seventh Edition)

Reference Books :

1. Software Engineering - Publication. Printice_Hall India,
   Author. Ian Sommarville
2. Software Engineering – Publication. Narosa
   Author. Pankaj Jalote

MCA

Semester-III

Teaching & Evaluation Scheme

Name of Program : Master in Computer Application

Effective from Academic Year-2023-24

MCA Semester-III

Sr. No.	Subject Code	Elective	Name of the Subject	Teaching Hours / Week				Evaluation Scheme / Semester								
								Theory					Practical (Marks)			Total
				Th	Tu	Pr	Credit Total	Internal Exam		University Exam		Theory Total	Internal Practical/Viva Exam*	University Practical Exam	Practical Total	
								Marks	Hrs	Marks	Hrs					
1	MCA-301		Cyber Security(સાયબર સિક્યુરીટી)	3		4	3+2	40	2	60	2½	100	40	60	100	200
2	MCA-302	Elective-I	Machine Learning (મશીન લર્નિંગ)	3		4	3+2	40	2	60	2½	100	40	60	100	200
		Elective-II	Blockchain Technology (બ્લોકચેઇન ટેકનોલોજી)													
		Elective-III	Data Warehouse and Data Mining (ડેટા વેરહાઉસ એન્ડ ડેટા માઇનીંગ)													
3	MCA-303	Elective-I	Internet of Things (ઇન્ટરનેટ ઑફ થિંગ્સ)	2	1	2	2+1+2	40	2	60	2½	100	40	60	100	200
		Elective-II	Fundamentals of Software Testing (ફન્ડામેન્ટલ્સ ઑફ સોફ્ટવેર ટેસ્ટિંગ)	3		2	3+2									
		Elective-III	Enterprise Resource Planning (એન્ટરપ્રાઇઝ રીસોર્સ પ્લાનીંગ)													

(Continue on next page)

Sr. No.	Subject Code	Elective	Name of the Subject	Teaching Hours / Week				Evaluation Scheme / Semester								
								Theory					Practical (Marks)			Total
				Th	Tu	Pr	Credit Total	Internal Exam		University Exam		Theory Total	Internal Practical/Viva Exam*	University Practical Exam	Practical Total	
								Marks	Hrs	Marks	Hrs					
4	MCA-304	Elective-I	Cloud Computing (ક્લાઉડ કમ્પ્યુટીંગ)	4		2	3+2	40	2	60	2½	100	40	60	100	200
		Elective-II	Advanced Database Management System (એડવાન્સ્ડ ડેટાબેસ મેનેજમેન્ટ સિસ્ટમ													
5	MCA-305		Communication Skills (સંચાર કૌશલ્ય)	2			2	40	2	60	2½	100				100
6	MCA-306		Software Application Development Project (Mini Project)				9	40 (Project Viva)		60 (Project Viva)		100				100
6			COMMUNITY LIVING (સમૂહજીવન)				Grade					Grade				Grade

નોંધ: ૧. જે વિષયમાં પ્રાયોગિક છે તે દરેક વિષયનાં સૈદ્ધાંતિક તથા પ્રાયોગિક બન્ને પ્રશ્નપત્રમાં પાસ થવું ફરજીયાત છે.

૨. સતત મૂલ્યાંકન એ આંતરીક મૂલ્યાકનનો એક ભાગ છે.

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MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA-301		
Course Name	Cyber Security		
Credits	Lecture : 03	Tutorial :	Practical: 02
Prerequisite	Programming experience in C/C++/Java/Python, Basics of web application, development, Computer Networks, Basics of Operating Systems.		
Course Objective	– Understand the concepts of Security, Cyber Security, and Cybercrimes. – Identify types of Cybercrimes and Attacks – Learn how the tools and methods that used by cyber criminals and protect systems from attackers. – Learn about importance of system security, configuration, and how to design and develop secure web application. – How to protect them self and ultimately society from such attacks. – Knowledge of security risk related to data and information. – Preparing for a platform to the students who wish to seek career or research in cyber security.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1:Introduction to Cyber Crimes: Introduction, Cybercrime: Definition and Origins of the Word Cybercrime and Information Security. Evolution of Cyber Crimes, Cybercriminals, Classifications of Cybercrimes and Cyber Criminals. Hackers. **Cybercrime: The Legal Perspectives**: An Indian Perspective, Cybercrime and the Indian ITA 2000. Digital Signature and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario **Cyberoffenses:** How Criminals Plan Them, Introduction, · How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS, Buffer Overflow, E-Mail Spoofing, Spamming, Cracking, Fraud and Forgery, Network Intrusions, Password Sniffing, Credit Card Frauds, Steganography, Phishing, Identity Theft (ID Theft)	15

Unit 2: Security and Cyber Security: Introduction, Security Concepts: Authentication, Authorization, Non-Repudiation, Integrity, Basic Cryptography, Encryption Techniques, Goal of Security – Confidentiality, Integrity, Availability, Authentication, Non-repudiation, Identification and Access Control: Password based authentication, Biometry, Access Token. Malicious Code and Classification of Malwares, Countermeasures to Malicious Code, Administrative Measures. **Network Security:** Defense and Analysis Techniques / Security Measures and Protection. Common Network-based Attacks, Taxonomy of Attack, Systems Vulnerability Scanning. **Network Layers, Protocols, Types of Network Attacks**: Types of Layers 2 attacks- CAM table attack, MAC address spoofing attack, ARP Poisoning. Network and Transport Layer Attacks: IP, ICMP based attacks, UDP flood, TCP SYN flood, Denial of Service Attack, Distributed DoS Attack, Zero-Day Attack, SSL - Architecture, SSL handshake protocol, TLS, HTTPS **Firewalls and Packet Filters:** Need of firewalls, characteristics of firewalls, Types of firewalls. **Cyber Crime Planning Phases:** 1) Reconnaissance-Active and Passive Attack. 2) Scanning and Scrutinizing Gathered Information- Port Scanning, Network Scanning and Vulnerability Scanning. 3) Attack/Exploit – Gaining and Maintaining System Access. 4) Post Attack Cleanup.	15
Unit 3: **Intrusion Detection:** Component of intrusion detection framework, types, Function of IDS, strengths, and limitations. **Exploitation:** Basics of exploitation, Basics of Metasploit framework, Search, use, show payloads, show options, set options, exploit. **Web Application Security:** Introduction to web server, HTTP, HTTPS, web application and web application stockholders/ users. **Web Application Hacking:** The Basics of Web Hacking, Input Validation– Client and Server-Side Validations, Consequences of Weak Input Validations and Sanitization. Importance of Input Sanitization. Learn consequences of Misconfiguration in Web Server, Application, Operating System, and Security Misconfiguration, Insecure Account Policies, Verbose Error Messages.	15

Common Web Vulnerabilities: Injection Vulnerabilities-SQL injection, LDAP Query, XPATH Queries, OS Command. Cross-site Scripting (XSS), Cross-site Request Forgery (CORS), Broken authentications and Session Management, Need of the Session Management, Session and Cookies Compromise and attacks, path traversal attacks. Countermeasures and fixes.	

Laboratory Work:

List of Experiments:

1. System Scanning using NMAP
2. Network vulnerability scanning
3. Vulnerability Scanning: system and Web application
4. Perform all types of web application attack on DVWA/Customize web application (Injection Attack, XSS, CORS, Password Cracking, etc.)
5. Automated SQL injection with SqlMap
6. Password Cracking – Using Password Cracking Tools, Dictionary Attack and Brute force Attack using Hydra
7. DoS and DDoS Attack and Prevention
8. Exploitation using Metasploit on Windows/Linux
9. ARP Poisoning using Cain and Abel
10. Network Intrusion Detection & Prevention System- Snort
11. Packet Sniffer and Analysis -Wireshark

Course Outcome:

After Completion of course, students able to:

- Explains concepts of Security, Cyber Security, and Cybercrimes.
- Identify types of Cybercrimes and Attacks
- Used to with various tools, techniques and methods that used by cyber criminals and protect systems from attackers.
- Design and develop secure web application.
- Protect them self and society from such attacks.
- Acquiring knowledge of security risk related to data and information.

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapure, Wiley.
2. The Basics of Web Hacking-Tools and Techniques to attack the web by Josh Pauli, Syngress

Reference Books :

1. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, McGraw Hill..
2. Information Systems Security by Nina Godbole, Wiley India.
3. Cryptography and network Security, Principles and Practices by William Stallings, Sixth Edition, Pearson.
4. Cyber Security & Global Information Assurance Information by Kennetch J. Knapp, Science Publishing.
5. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneir, 20th Anniversary Edition, John Wiley & Sons.
6. Network Security Essentials Applications and Standards by William Stallings, 5th Edition, Pearson.
7. National Cyber Crime Reference Handbook - National Cyber Safety and Security Standards.

- **List of Software / Learning Web References**

1. Kali Linux: https://www.kali.org
2. Windows OS: Window 10/7/XP
3. Metasploit: https://www.metasploit.com
4. Exploit DB: https://www.exploit-db.com/
5. Network Intrusion Detection & Prevention System: https://www.snort.org
6. THC Hydra: https://www.cyberpunk.rs/password-cracker-thc-hydra
7. SqlMap: https://sqlmap.org/
8. VirtualBox: https://www.virtualbox.org/
9. Damn Vulnerable Web Application (DVWA): https://dvwa.co.uk/

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MCA SEMESTER - III
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Course Code	MCA-302		
Course Name	Machine Learning		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite	Elementary Mathematics and statistics		
Course Objective	This course introduces several fundamental concepts and popular machine learning algorithms with an introduction to artificial intelligence and deep learning. Familiarize the students with data preprocessing, data cleaning, data exploration, data visualization learning algorithms, techniques and their applications. The course will be accompanied by hands-on problem of moderate complexity solving with programming language.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Introduction to the fundamental concepts in machine learning and popular machine learning algorithms. Supervised Learning, Unsupervised learning and reinforcement learning. Importance of data and its attributes, Data Cleansing & Preposing. Problem of over fitting, under fitting and Bias Variance trade-off, Issues of imbalance data set & synthetic data generation technic. Introduction to important libraries for data prepossessing and data visualization.	10
Unit 2: Supervised learning Algorithm **K-Nearest Neighbours(K-NN)** Introduction to K-NN, Distance formula (Euclidean distance, hamming distance), Significance of k, find k closest neighbours, Bias–Variance Trade-off, vote for labels or calculate the mean, Advantages and disadvantages of K-NN **Naive Bayes** Introduction to Naïve Bayes, Bayes Theorem & Assumption, The zero-frequency problem, Types of Naïve Bayes Classifier, Constructing a Naive Bayes Classifier. Pros and Cons of Naive Bayes, **Decision Trees** An introduction to Decision Tree ,Types of Decision Trees based on target variable , Terminologies Used, Splits in Decision Trees, Gini Index, Chi – Square, Entropy / Information Gain, Reduction in Variance, Shortcomings in decision Trees, Advantages & Disadvantages of Decision Trees	15

Support Vector Machine An Introduction SVM, Hyperplane, Support Vectors, Soft Margin SVM, Regularization Parameters, Significance of C, SVM Kernels & kernel trick , Effect of Gamma, Introduction to Multiclass SVM	
Unit 3: **Linear Regression** Introduction to Linear Regression ,Linear Regression Cost Function, Linear Regression using Gradient Descent Algorithm, About the assumptions in Linear Regression Algorithm, Evaluating Metrics for Regression **Logistic Regression** Introduction to Logistic Regression and limitation of Linear Regression model, Sigmoid Function, Decision Boundary Intuition with Examples, On-Linear Decision Boundaries, Hyperparameter Tuning, Overview of Methods of Hyperparameter Tuning, Logistic Regression, Cost Function, Gradient Descent Evaluation Metrics for Logistic Regression, Confusion Matrix ,Precision and Recall, F-1 score, Area under ROC curve, Logarithmic Loss. **Unsupervised learning Algorithm** **K-means clustering** Introduction to K-means clustering, Mathematical Representation, Expectation-Maximization, K-Means Clustering Algorithm, Popularity of K-Means, Shortcomings Of K-Means **Principle Component Analysis**. (Feature Reduction/Dimensionality reduction) Evaluating model performance, improving model performance, advanced topics in machine learning	15
Unit 4: Foundation for AI Introduction to AI and Application Area, AI Basic, Introduction to ANN (Perceptron and MLP), Introduction to Deep learning	05

Self Study:
Assignment 1. Introduction to OpenCV

Laboratory Work:
1. Classification using KNN. 2. Spam identification using Nave Bayes. 3. Binary classification using Decision Tree 4. Linear Regression 5. Logistic Regression 6. Support Vector Machines 7. K-means Clustering 8. Principal Component Analysis

Mini Project

1. OCR
2. Build QR Code creator & detector (mobile App)
3. Object detection with Raspberry Pi
4. Data visualization Dashboard using python library
5. Any other

Course Outcome:

After Completion of course, students would be:

- Understand the meaning, purpose, scope, stages, applications, and effects of Machin learning.
- Gain an in-depth understanding of data pre-processing, data cleaning, data exploration, data visualization and handling imbalance data.
- Understand the concepts of supervised and unsupervised learning models, including K-NN, Naïve Bays, Decision Tree, linear regression, logistic regression, SVM, clustering, dimensionality reduction.
- Student able to formulate the Machine Learning problem and create the model.
- Evaluate and improve the model performance.
- Understand the concept of artificial neural network, and deep learning and Image processing.

Text Books:

1. Python Machine Learning by Sebastian Raschka, Pact Publication.
2. Practical Machine Learning by Sunil Gollapudi, Pact Publication.

Reference Books :

1. Building-Machine-Learning-Systems-with-Python by Richert-Coelho , Pact Publication.
2. Scikit-learn: Machine learning in Python by Pedregosa Fabian, et al., Journal of Machine Learning Research 12. Oct (2011): 2825-2830.
3. Mastering Machine Learning Algorithm by Jason Brownlee.

Web reference

1. https://swayam.gov.in/nc_details/NPTEL
2. https://epgp.inflibnet.ac.in/
3. https://towardsdatascience.com/

Blog on medium

- It is recommended that student should write blog (any language) on medium or any other site.

Note: Practical Internal /External evaluation:

1. **70 % Lab experiments and**
2. **30% Mini Project**

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MCA SEMESTER - III
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Course Code	MCA-302		
Course Name	Blockchain Technology		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite			
Course Objective	- Understand how blockchain systems work. - Securely interact with them. - Design, build, and deploy smart contracts and distributed applications, - Integrate ideas from blockchain technology into their own projects.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Introduction to Blockchain Introduction to Blockchain Technology. Idea of Centralized, Decentralized and Distributed system, Blockchain as a Public ledger. Problems with a centralized system. How Blockchain as a distributed ledger solve this problem. Advantage over conventional distributed database. Consensus models – concept. Consensus Algorithms – PoW, PoS, PBFT, DPoS, PoA, PoET .Comparative study of Consensus Algorithms	15
Unit 2: BitCoin Introduction to Bitcoin. Working of Bitcoin Blockchain. How Bitcoin achieve Decentralization (Distributed consensus) Bitcoin transactions, Bitcoin blocks, Bitcoin scripts, Bitcoin Network, Limitation & improvements. How to store and use Bitcoins – Hot and cold storage, online wallets and Exchanges, payments services, transaction fees, currency exchange market. Bitcoin Mining – The tasks of bitcoin miners, Mining hardware, Energy consumption & Ecology, Mining pools, Mining incentives and strategies. Types of Blockchain & its use cases and limitations. Blockchain in Financial services: Payments and Securities Trading – cross border payments, Steller protocol and network, Ripple protocol and network. Logistics. Supply chain	15
Unit 3: Digital currency and its Introduction. Crypto currency. Virtual currency. E-wallets – types, examples and working. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof. Permissionless Blockchain - Ethereum, Ethereum Blockchain and smart contracts, solidity, Dapps. Permissioned Blockchain - Introduction,	15

Hyperledger, Fabric services, Fabric model & functions, Composer, Corda. Decentralized Application Platforms. Alternative Decentralized Solutions – Interplanetary File Systems (IPFS), Hashgraph	

Laboratory Work:	**60 HRS**

- Exploring Bitcoin Blockchain – Blocks, transactions, hash, nonce, Wallet opening
- Introduction to Ethereum local Blockchain – Ganache, wallet – Metamask, development environment, testing framework – Truffle
- Smart contracts development and Dapps Development – 6(Coin demo, BallotV1 Demo, stateTransV2, BallotV2 Demo, BallotV3 Demo, BallotV4 Demo)
- Hyperledger Composer Demo – 1
- IPFS practical – 1
- Integration of Dapps and smart contracts with IPFS(IPFS Image Storage DApp Tutorial)

Course Outcome:

After Completion of course, students would be:

- Understand the concept of digital currency, virtual currency and crypto currency.
- Blockchain concepts, benefits and limitations of blockchain technology.
- Different cryptographic concepts used in Blockchain design.
- Different blockchains method of work.
- Understand the technical details of blockchain technology.
- Get knowledge about various case studies and types of Blockchain

Text Books:

1. Bitcoin and Cryptocurrency Technologies by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press, 2016.
2. Mastering Ethereum by Antonopoulos, Andreas M. and Gavin Wood, O'Reilly Media, Inc., 2018. (Free draft available at https://github.com/ethereumbook/ethereumbook)

Reference Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, O'Reilly Media, Inc., 2014.
2. The Science of the Blockchain by Wattenhofer, Inverted Forest Publishing, 2016.
3. Blockchain: The Blockchain for Beginners Guide to Blockchain Technology and Leveraging Blockchain Programming by Josh Thompson, CreateSpace Publishing, 2017.

Web reference:

- Hyperledger Fabric, https://www.hyperledger.org/use/fabric
- IPFS, https://ipfs.io/Web reference

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Course Code	MCA-302		
Course Name	Data Warehouse and Data Mining		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite	- Basic knowledge of Database, Data Structure. - Should aware about basic methods of statistics - Should be aware of OLTP		
Course Objective	- This subject is about mining of data from very large database system to make students learn about different methods of analyzing data and strengthen the decision making process, that includes collection of data from different sources, visualization of data, cleansing of data, processing data and boost decision making process. - It also includes large database sources like data warehouse modeling, designing and developing exposure to students. - Data warehouse management with its architecture and various models like star schema, snowflake schema with dimensional modeling helps to implement such systems. - Data mining introduces basic concepts and techniques like classification and clustering. It will help students to solve data mining problems using various software.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Introduction to data warehousing and mining • Why and what is data mining and data warehousing • Kinds of Data • Kinds of Patterns • Various data sources and collection of data • Various technologies used for collections • Kinds of Applications • Issues in Data Mining • Data Objects and Attribute • Basic Statistical Descriptions of Data • Data Visualization using data marts and data warehouse • Measuring Data Similarity and Dissimilarity • Data Pre-processing • Data Cleaning • Data Integration	12

• Data Reduction • Data Transformation and Data Discretization	
Unit 2: Data Warehousing and Online Analytical Processing • Data Warehouse: Basic Concepts • Data Warehouse Modeling: OLAP, ROLAP, MOLAP • Data Warehouse Design and Usage : star schema and snowflake schema • Data Warehouse Implementation • Data Generalization by Attribute-Oriented Induction • Data Cube Technology • Data Cube Computation: Preliminary Concepts	15
Unit 3: Classification • Basic Concepts • Decision Tree Induction • Regression method • CART classification and regression method • Model Evaluation and Selection • Techniques to Improve Classification Accuracy	10
Unit 4: Cluster Analysis • Cluster Analysis • Partitioning algorithm • K-means algorithm • Model Evaluation of Clustering	08

Laboratory Work:
○ Collection of data from heterogeneous sources ○ Preprocessing methods ○ Cleaning ○ Scrubbing ○ Transformation ○ Processing ○ Implementation of star schema and snowflake schema ○ Aggregating data of star schema ○ Data mining techniques using Python/ R system / WEKA / golang ○ Decision tree classification ○ Logical and linear regression ○ Partitioning cluster technique ○ K-means algorithms for clustering

Course Outcome:
After Completion of course, students would be:
- Heterogeneous data sources and collection of data from various platforms - Data collections, cleansing, scrubbing and transformation techniques. - Implementation of data warehouse system in the environment and design and develop model according to requirements of applications.

- Handling various data mining tools for classification and clustering techniques
- Evaluation of a model according to data and suggest appropriate methods for decision making.
- It will help to develop and apply critical thinking, problem-solving, and decision-making skills.
- It will boost the knowledge discovery process

Text Books:

1. Data Mining – Concepts and Techniques by Jaiwei Han and Micheline Kamber, Elsevier, Third Edition.
2. Data Mining: Introductory and Advanced Topics by Margaret Dunham, Prentice Hall.
3. Building the Data Warehouse by W. H. Inmon, 3rd edition

Reference Books:

1. Introduction to Data Mining, Tan P-N, Steinbach M., Kumar V., Addison Wesley, 2006.

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Course Code	MCA-303		
Course Name	Internet of Things		
Credits	Lecture : 2	Tutorial : 1	Practical: 2
Prerequisite	Student should have basic knowledge of Embedded system, Networking concepts and protocols, Knowledge of computer programming, Network Security		
Course Objective	- Understand general concepts of Internet of Things (IoT) - Apply design concept to IoT solutions. - Analyze various M2M and IoT architectures and Evaluate design issues in IoT applications. - Recognize various devices, sensors, and applications. - Create IoT solutions using sensors, actuators, devices, and cloud. - Build/Design of applications/solution that will communicate with IoT hardware and software.		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1:Introduction to Internet of Things • Definition and characteristics of Internet of Things (IoT) • Applications of IoT in various domains • Importance of IoT • Physical design of IoT: Hardware elements of IoT and their characteristics, IoT protocols - Link Layer, Network/Internet Layer, Transport Layer, Application Layer • Logical Design of IoT: IoT functional blocks, IoT Communication Models – Request-Response, Publish-Subscribe, Push-Pull, IoT Communication APIs- REST-based communication APIs, WebSocket-based communication APIs, Micro services. • Introduction to IoT Enabling Technology – Wireless Sensor Network, Cloud Computing, Big Data Analytics, Embedded Systems • IoT Levels & Deployment Template	15
Unit 2: **Introduction to IoT and M2M** • Difference between IoT and M2M, • Sensors, actuators, and other devices employed in IoT. • Security and privacy concerns in IoT **IoT Platforms Design Methodology** • Purpose and requirement specification	15

• Process Specification • Domain model Specification • Information model Specification • Service Specifications • IoT level Specification • Functional view Specification • Operational view Specification • Device and component integration • Application development	
Unit 3: Interoperability in IoT: • Introduction to microcontroller/MCU and SoC, Sensors, actuators, and other devices employed in IoT. • **Arduino** - Introduction to the Arduino - Basic building block, Components of Board, Interfacing with the Arduino for Data Transfer and Reading/writing, General Purpose Input/output PIN, Hardware Interfacing & Programming: Sensor, Actuator, Buzzer, LED etc. - Arduino shields - Arduino programming and the Arduino IDE - Introduction to EPS8266 - Wireless communication and programming with EPS8266 - Communication with cloud • IoT Physical Servers & Cloud Offerings • Wired/Wireless control and communications with the Arduino/ Raspberry Pi	15

Laboratory Work:
Development of Small/Medium Sized IoT Projects using Arduino/ Raspberry Pi, sensors, actuators, and other devices. **List of Experiments:-** Practical list should be prepared based on the content of the subject with following guidelines in mind. • Experiments/Tutorials related to course content will be carried out in the laboratory. • Practical list should be designed with real life examples. • List should be prepared to cover individual concepts and integration of different concepts on real life problems.

Course Outcome:
After Completion of course, students would be:
- IoT concepts and IoT Standards, - Understand concepts, architecture, and relevance of IoT System for the future, build IoT Applications. - Familiarity with the hardware elements of IoT and the communication protocols commonly used with IoT.

- Work with sensors, actuators, and other devices
- Security and privacy issues with IoT
- Basic knowledge of developing Arduino/ EPS8266 based IoT projects

Text Books:

1. Internet of Things: A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti, 1st Edition, Universities Press, 2014.

Reference Books :

1. The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi, and Beaglebone Black by Donald Norris, McGraw-Hill Education.
2. Make – Raspberry Pi and AVR Projects by Hoile C., et al., MakerMedia, 2014.
3. Arduino Cookbook by M. Margolis, 2nd Edition, O'Reilly, 2011.
4. The Official Raspberry Pi Beginner's Guide by G. Halfacree, Raspberry Pi Press, 2018.
5. Getting Started with the Internet of Things by Cuno Pfister, O"Reilly Media, 2011.

List of Software / Learning Web References

1. Arduino
   - Arduino Documentation
     https://docs.arduino.cc
2. Raspberry Pi
   - The Official Raspberry Pi Beginner's Guide (online)
     https://www.raspberrypi.org/magpiissues/Beginners_Guide_v1.pdf .
   - The Official Raspberry Pi Projects Book (online),
     https://www.raspberrypi.org/magpiissues/Projects_Book_v1.pdf

Teaching Belief/Philosophy and Practices

1. Generate and sustain student interest.
2. Maintain a balance on teaching and learning.
3. Provide complete educational experience beyond classrooms and courses.

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MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA-303		
Course Name	Fundamentals of Software Testing		
Credits	Lecture : 3	Tutorial :	Practical: 2
Prerequisite	Basic concepts of Software Engineering		
Course Objective	- To study fundamental concepts in software testing - Gain knowledge of various testing approaches - Learn how to plan a test project, design test cases and test data - Understand testing management - Understand software test automation problems and solutions - Gain knowledge of various testing tools		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: Fundamentals of Testing Human and errors, Testing and Debugging, Software Quality, Requirement Behaviour and Correctness, Fundamentals of Test Process, Psychology of Testing, General Principles of Testing, Test Metrics **Approaches to Testing: Static Testing** Structured walkthrough, Static Analysis, Control flow & Data flow, Determining Metrics	10
Unit 2: Approaches to Testing: Dynamic Testing Black Box Testing : Equivalence Class Partitioning, Boundary Value Analysis, State Transition Test, Cause Effect Graphing and Decision Table Technique and Used Case Testing and Advanced black box techniques White Box Testing : Flow graph notation, Statement Coverage, Branch Coverage, Test of Conditions, Path Coverage, Advanced White Box Techniques, Instrumentation and Tool Support Gray Box Testing : Intuitive and Experience Based Testing	14
Unit 3: Test Management Test Organization, Test teams, tasks and Qualifications, Test Planning, Quality Assurance Plan, Test Plan, Prioritization Plan, Test Exit Criteria, •Cost and economy Aspects **Test Strategies** Preventive versus Reactive Approach, Analytical versus heuristic Approach, Test Activity Management, Incident Management, Configuration Management, Test Progress Monitoring and Control	09

Unit 4: Specialized Testing Performance, Load, Stress & Security Testing **Testing Tools** Automation of Test Execution, Requirement tracker, Tools for Test Management and Control, Test Specification, Static Testing, Dynamic Testing, Non-Functional Testing, Tool Selection and Introduction, Cost Effectiveness of Tool	12

Laboratory Work:	
Practical will be based on Manual as well as Automation based testing	
1.	Find Cyclomatic complexity of given codes.
2.	Given a program seeded with errors. Use static testing methods to identify the defects.
3.	Perform statement & path coverage on given program and design the test case for both.
4.	Create test cases for given program that have maximum condition coverage.
7.	Create test cases using boundary value analysis technique for given set of programs.
8.	Find out test cases using Equivalence Partitioning technique for given set of programs.
9.	Perform white box testing for given code of programs. Compare number of error detected for different approaches.
10.	Perform black box testing for given code of program. Use following techniques [A] Requirement Based Testing [B] Positive Testing [C] Negative Testing
11	Using any automated testing Tools to Automate Testing Using of Open Source Testing Tools for databases, Web applications and Networks etc.

Course Outcome:
After Completion of course, students would be:
- Identify and apply appropriate testing techniques. - Gain ability to design and conduct a software test process - Learn to apply testing tools. - Understand and identify various software testing problems and design solutions

Text Books:

1. An Integrated Approach to Software Engineering by Pankaj Jalote, 3rd Edition; Narosa Publishing House.

Reference Books:

1. Software Testing Foundations by Andreas Spillner, Tilo Linz, Hans Schaefer; Shoff Publishers and Distributors.
2. Software Testing: Principles and Practices by Srinivasan D and Gopalswamy R; Pearson Ed, 2006.
3. Foundations of Software Testing by Aditya P. Mathur; Pearson Education custom edition 2000.
4. Testing Object Oriented Systems: models, patterns and tools by Robert V Binder, Addison Wesley; 1996.
5. Software Engineering – A practitioner's approach by Roger S. Pressman, 7th Edition; McGraw Hill.
6. The art of software testing by GJ Myers; Wiley.

Department of Computer Science
Gujarat Vidyapith, Ahmedabad – 14

MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA-303		
Course Name	Enterprise Resource Planning		
Credits	Lecture: 3	Tutorial: 0	Practical: 2
Prerequisite	Knowledge of Computer Science and Computer Programming		
Course Objective	- Understand principles of ERP - Develop the basic understanding of how ERP operates in organizations to achieve growth - Understand key implementation methodology - Know business Modules - Map business processes - Know ERP Software - Work with ERP System in real world - Know future directives of ERP		
Total Number of Lectures	45		

Lectures with Breakup	**Number of Lectures**
Unit 1: About ERP o Introduction o Definition of ERP o Need for ERP o Evolution of ERP o Characteristics of ERP o Architecture of ERP o Applications of ERP o Benefits of ERP • **ERP Functional Modules** o Production Planning Module o Purchasing Module o Inventory Control Module o Sales Module o CRM Module o Marketing Module o Financial Module o HR Module	15
Unit 2: • **Business Process Reengineering** o Business Process and Practice o Reengineering	15

○ Business Process Management • **Supply Chain Management** ○ Processes in Supply Chain ○ Components of Supply Chain • **ERP Implementation** ○ Planning Evaluation and Selection of ERP ○ ERP Implementation Life Cycle - Pre Evaluation Screening - Package Evaluation - Project Planning Phase - Gap Analysis - Reengineering - Configuration ○ Implementation - Implementation Team Training - Testing - Implementation - Migration - End User Training ○ Post Implementation - Maintenance of ERP - Organizational and Industrial Impact - Success Factors of ERP Implementation - Key Success Factors - Failure Factors of ERP Implementation	
Unit 3: • **ERP Software** ○ Working with ERP Software and Case Study - Architecture and Overview - Development Environment - New Application - Models And Basic Fields - About Security - User Interface - Views - Relations Between Models - Computed Fields - Working on Action - Constraints - Sprinkles - Inheritance - Interacting with Modules - QWeb - Coding Guidelines • **Future Directions in ERP** ○ Extended ERP Systems ○ New Trends in ERP	15

Self Study:
Current and Latest Trends and Technologies in ERP

Laboratory Work:
Practical based on functionalities and modules of ERP

Course Outcome:
After Completion of course, students would be able to:
- Apply principles and approaches of ERP - Prepare strategies for ERP implementation - Create reengineered business processes for successful ERP implementation - Map business processes with ERP Software - Work with ERP implementation - Work with real world business processes - Provide solutions to business needs

Text Book:

1. Enterprise Resource Planning by Garg and Venkitakrishnan, PHI Publication.

Reference Books:

1. Enterprise Resource Planning by Thomas and Michael, John Wiley and Sons, Inc.
2. Enterprise Resource Planning by Alexis, Tata McGraw Hill

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MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA - 304		
Course Name	Cloud Computing		
Credits	Lecture : 4	Tutorial : -	Practical: 2
Prerequisite	To learn Cloud Computing you need to have basic knowledge of Operating Systems and Networking		
Course Objective	- To enable the students to learn the fundamental and technological aspects of Cloud Computing, Virtualization along with various terminologies used in Cloud Computing and virtualization - To make them understand the various Applications, Architectures of Cloud Computing and Virtualization - To make them aware about cloud capabilities across the various cloud service models including IAAS, PAAS, SAAS - To enable students to develop cloud based software applications on top of cloud platforms - To make them aware about security challenges in cloud computing		
Total Number of Lectures	60		

Lectures with Breakup	**Number of Lectures**
Unit 1: Cloud Computing Fundamentals Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications	08
Unit 2: Virtualization and Cloud Applications Virtualization Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization techniques, Types of Virtualization. Virtualization and Cloud Computing: Pros and Cons of Virtualization. Technology Examples: Xen-paravirtualization, VMware- Full Virtualization, Microsoft Hyper-V, Docker, Kubernetes. Cloud Applications: Scientific: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Biology: Gene Expression Data Analysis for Cancer Diagnosis, Geoscience: Satellite Image Processing. Business and Consumer Applications: CRM and ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming	22
Unit 3: Cloud Security Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service	15

Security Virtualization Security Management: Virtual Threats, VM Security Recommendation, VM Specific Security Techniques Cloud Computing Security Architecture: Architectural Considerations, General Issues, Data Security, Application Security Trusted Cloud Computing, Secure Execution Environments and Communications, Identity Management and Access Control: Identity Management, Access Control, Autonomic Security Disaster Recovery in Clouds	
Unit 4: Application Development Technologies and the processes required when deploying web services, deploying a web service in cloud architecture, Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google AppEngine	15

Laboratory Work:
- Cloud based application development

Course Outcome:
After Completion of course, students would be:
- familiar with fundamentals of cloud and its architecture - familiar with virtualization and its benefit - able to compare various cloud computing platforms - able to program various application to test the cloud functionality - able to analyze the performance, scalability and availability of the underlying services - able to identify potential area of cloud implementations (reference to real time problem) and its benefit to the organization - able to identify privacy and security issues in cloud computing

Reference Books:

1. Cloud Computing, A Practical Approach by Toby Velte, Anthony Velte, Robert Elsenpeter, McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.
2. Cloud Computing: Principles and Paradigms by Rajkumar Buyya et. el., Wiley India Edition.
3. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, Tata McGraw Hill, ISBN-13: 978-1-25-902995-0, New Delhi, India, Feb 2013.
   Enterprise Cloud Computing Technology Architecture Applications by Gautam Shroff, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.
4. Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online by Miller Michael, Pearson Education India
5. Cloud and Virtual Data Storage Networking by Greg Schulz, Auerbach Publications [ISBN: 978-1439851739], 2011.
6. Foundations of Green IT by Marty Poniatowski, Prentice Hall; 1 edition [ISBN: 978-0137043750], 2009.

7. Information Storage and Management by EMC, Wiley; 2 edition [ISBN: 978-0470294215], 2012.
8. Cloud Computing Bible by Sosinsky B., Wiley India.

Web Reference:

1. http://epgp.inflibnet.ac.in/

Department of Computer Science
Gujarat Vidyapith, Ahmedabad – 14

MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA – 304		
Course Name	Advanced Database Management System		
Credits	Lecture : 4	Tutorial :	Practical: 2
Prerequisite	- Basic knowledge of Database and operating system - Relation database architecture - Should be aware of relational transactional and concurrency mechanism		
Course Objective	- This subject is about advanced methods of database administration. It includes creation of database, managing storage. - Physical memory allocation and concurrency problem of database system with reference to locking data. - Third part data handling and migration of data from one server to another by data pumping method. - It also throw light on tuning of memory with various database components to change the structure and also Input-output with conventional and direct methods. - Application tuning with reference to effective query writing, find the query execution plan and find the hit ratio for query processing using its objects.		
Total Number of Lectures	60		

Lectures with Breakup	**Number of Lectures**
Unit 1: The Database Instance and Database Architecture • Defining the Instance • Creating the Instance • Understanding the Instance • Defining the Database • Different schema for system administration • Understanding the Components of the Database • Understanding Database Segments • Other Database Objects • Creating the Environment • Designing an Optimal Flexible Architecture • Creating Database	15
Unit 2: Export-Import & loading data from third party s/w, SQL with programming • IMPORT/EXPORT	15

○ Export with Data pump utility ○ Import with Data pump utility • Loading data from third party database ○ With various cases like truncation of data , conversion of data, filtering data with where clause ○ Different Loader Examples ○ Conventional and Direct Path Loading • Administering SQL commands ○ Create, Alter, Truncate, Drop etc. DDL and DCL SQL commands ○ Tracing SQL Statements • SQL Programming ○ Stored subprograms and packages ○ Defining Stored Subprograms ○ Building and Using Stored Programs	
Unit 3: Managing Storage and Lock, Supplied Oracle Database package • Managing Database Storage ○ Administering Database Objects ○ Understanding Database Fragmentation ○ Managing Rollback Segments ○ Identifying Storage Problems ○ Administering Growing Database • Integrity Management • Locking – ○ Implementing Locks ○ Analyzing lock table ○ Monitoring Locks on the System ○ Avoiding Locks & Possible Solutions ○ Implementing Locks with Latches	15
Unit 4: Performance tuning fundamentals • Understanding need of tuning • Knowing the Tuning Principles • Tuning Goals • Using the Return on Investment Strategy • Revisiting Application Types • Using Diagnostic Tools • Application Tuning ○ Understanding the Optimizer ○ SQL Trace and derivation of statistics ○ Understanding execution plan • Tuning Memory ○ UTLBSTAT/UTLESTAT ○ Tuning the Shared Pool ○ Tuning the Database Buffer Cache ○ Tuning the multithreaded Server (MTS) ○ Tuning Locks, • Tuning I/O –	15

schema. And implement cascade update and delete on department table for any employee.

Note: design your structure which is suitable for above scenario.

18. Write a procedure to display object level and database level fragmentation in database. And also prepare a list of migrated row in your schema. Justify your output.
19. Write a query to find execution plan and discuss it with explain plan by optimizing query processing using various components.

Course Outcome:

After Completion of course, students would be:

- Student will learn about advanced methods of database creation, management and administration. It includes creating all the objects with its storage criteria.
- Background Processes of database and its usage of physical memory allocation.
- Concurrency problem of database system with reference to locking data and concurrent processes by latching mechanism.
- Data export and Import and data transferring from third party software using loader.
- Database utilities like to find statistics of query execution with various parameters like cpu time, elapsed time, actual time etc. Students will also learn about various object and its importance in query execution to find the cost of query using rule based analysis and cost based analysis.
- Memory tuning with reference to effective query writing and changing initialization parameters for memory structure and background processes. It will also help to learn I/O computation with reference to primary and secondary memory.

Text Books:

1. Oracle 10g Performance Tuning by Rajeev Parida, Firewall media.
2. The power of Oracle 10g by Rajeev Parida, Firewall Media.
3. Database Administration: The Complete Guide to DBA Practices and Procedures by Craig S. Mullin, 2nd Edition, Kindle Edition.

Reference Books :

1. Oracle Complete Reference by Oracle press
2. Oracle DBA by Oracle press

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MCA - SEMESTER - III
(Effective from Academic Year – 2021-22)

Course Code	MCA-305		
Course Name	Communication Skills		
Credits	Lecture : 2	Tutorial :	Practical:
Prerequisite	Basic English		
Course Objective	- Enable students to communicate clearly and with impact - Improve their verbal and non-verbal communication styles - Enhance their interpersonal skills		
Total Number of Lectures	30		

Lectures with Breakup	**Number of Lectures**
Unit 1: The process of communication Need for Communication, Characteristics of Communication, Barriers of communication, Means of Communication, Effective Communication, Different types of communication, Personal communication, Telephonic communication, Communication in Business Organizations	6
Unit 2: Interview Curriculum vitae, Presentation of Content, The Essential Features of an Interview, Types of Interviews, Interview Techniques, Interviewer's Preparation for the Interview, Group Discussions, How to Conduct Interviews, How to Become an Effective Interviewer, Interviewee's Preparation for Interviews, Arriving for an Interview, How to Conduct One's self during an Interview, Suggestions to Ensure success of an Interview	9
Unit 3: Presentation Defining Purpose; Audience & Locale, Organizing Contents; Preparing Outline, Nuances of Delivery, Nuances of Voice Dynamics, Importance of body language, Pronunciation, Visual aids, Podium panic, Speaking	8
Unit 4: Public Speaking Presentation of Content, Characteristics of a Good Speech, Guide Lines for Preparing a Speech, Profile of a Good Speaker, Planning to Speak, Examples of Speeches	7

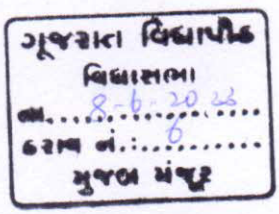
Course Outcome:
After Completion of course, students would be:
- Understand the role of communication in personal & professional success - Develop awareness of appropriate communication strategies - Prepare for interviews - Present messages with a specific intent

Reference Books :

1. Communication Skills by Leena Sen, 2nd Edition, PHI.
2. Basic Communication Skills for Technology by Andrea J. Rutherford, 2nd Edition, Pearson Education.
3. Business Communication Today, Pearson Education.
4. Lesly's Hand Book of PR and Communication by Phillip Lesly.

MCA SEMESTER - III
(Effective from Academic Year – 2023-24)

Course Code	**MCA-306**
Course Name	**Software Application Development Project (Mini Project)** સૉફ્ટવેર એપ્લીકેશન ડેવેલોપમેન્ટ પ્રોજેક્ટ (મીની પ્રોજેક્ટ)
Credits	Total : 9
Prerequisite	Programming experience
Course Objective	– To Apply of the collective knowledge gained in all the courses – Will learn team work – To improve clear communication channels and skills – Learn effective networking and task delegation abilities



Gujarat Vidyapith
Department of Computer Sc.
(Faculty of Management and Technology)

MCA Semester-IV

(Effective from Academic Year 2021-22)

MCA SEMESTER - IV
(Effective from Academic Year – 2021-22)

Course Code	**MCA-401**
Course Name	**Project Work** પરિયોજના કાર્ય
Credits	Total : **30**
Prerequisite	Programming experience
Course Objective	– To Apply of the collective knowledge gained in all the courses – Will learn team work – To improve clear communication channels and skills – Learn effective networking and task delegation abilities

********** END of MCA -401 **********

Teaching & Evaluation Scheme

Name of Program : Master in Computer Application

Effective from Academic Year-2021-22

MCA Semester-IV

Sr.No.	Subject Code	Elective	Name of the Subject	Teaching Hours / Week				Evaluation Scheme / Semester								
								Theory					Practical (Marks)			Total
				Th	Tu	Pr	Credit Total	Internal Exam		University Exam		Total	Internal Practical/Viva Exam*	University Practical Exam	Practical Total	
								Marks	Hrs	Marks	Hrs					
1	MCA-401		Project Work(પરિયોજના કાર્ય)				30	40		60		100				100
2			COMMUNITY LIVING (સમૂહજીવન)				Grade					Grade				Grade

નોંધ: ૧. જે વિષયમાં પ્રાયોગિક છે તે દરેક વિષયનાં સૈદ્ધાંતિક તથા પ્રાયોગિક બન્ને પ્રશ્નપત્રમાં પાસ થવું ફરજીયાત છે.

૨. સતત મૂલ્યાંકન એ આંતરીક મૂલ્યાકનનો એક ભાગ છે.