

**Kadi Sarva Vishwavidhyalaya**

**MCA Syllabus**

**(Effective from August 2020)**

# **SEMESTER – I**

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 11:Object Oriented Technology**

#### **Rationale:**

1. To emphasize on the use of object oriented technology and the paradigm (Core Java is taken as the platform to describe the technology) and the importance of practical oriented learning.
2. To develop proficiency among students in creating console based and GUI based applications using the Java Programming Language.
3. To give the flavor of “Write Once, Run Anywhere” concept to the students
4. To give students a good understanding of developing multi-threaded applications using the Java Programming Language.

**Prerequisite:** Working/Basic knowledge of Object Oriented Programming Language (C++)

#### **Learning Outcomes:**

At the end of the course, student will be able to:

1. Become comfortable with object oriented programming: Learn to think in objects
2. Understand the use of APIs in robust, enterprise three level application developments.
3. Understand the essentials of the Java class library, and understand how to learn about other parts of the library when you need them.
4. Develop event driven Graphical User Interface (GUI) programming

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test,

Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

##### **UNIT – I : JAVA FUNDAMENTALS**

**[20%]**

Java's magic : The Bytecode, A First Simple Program, Lexical Issues, Difference between object-oriented programming language and object-based programming language.Data Types, Variables, Arrays ,Wrapper Classes, java.util classes: Date, Calander, Math, Scanner , Operator, Operator Precedence, Using Parenthesis, Control Statements

**UNIT – II : OOPS CONCEPTS****[20%]**

Class Fundamentals Declaring objects, Introducing methods, Constructors, The this keyword, Garbage collection, The finalize() method, Overloading methods, Understanding static, Introducing final, Using command line arguments Inheritance Basics, Using super, Method overriding, Dynamic Method Dispatch, Using Abstract Classes

Packages - Defining a Package, Access Protection, Importing Packages, Interfaces – Defining an Interface, Implementing Interfaces

**EXCEPTION HANDLING**

Exception handling fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's Built-in exceptions, Creating your own exception sub classes.

**UNIT – III : INPUT OUTPUT AND STRING****[20%]****INPUT OUTPUT**

I/O Basics, Reading Console Input – Reading characters, Reading Strings, Reading & Writing files, File - Directories.

**INPUT OUTPUT: Exploring java.io**

The Stream Classes, The Byte streams – InputStream, OutputStream, FileInputStream, FileOutputStream, Buffered Byte streams- BufferedInputStream, BufferedOutputStream, The Character streams - Reader, Writer, FileReader, FileWriter, BufferedReader, BufferedWriter. **STRING**

**HANDLING**

The String Constructors, String Length, Special String Operations - String Literals, String Concatenation, Character Extraction - charAt(), getChars(), String Comparison - equals() and equalsIgnoreCase(), compareTo(), Searching Strings, Modifying a String, StringBuffer – StringBuffer Constructors, length() and capacity(), append(), insert(), delete(), deleteCharAt(), replace().

**UNIT – IV****[20%]****SYNCHRONIZATION IN MULTITHREADED PROGRAMMING**

Java Thread Model, Creating a Thread – Implementing Runnable, Extending Thread, Thread Priorities, Synchronization – using synchronized methods, Inter thread Communication, Suspending, resuming and Stopping Threads.

**THE COLLECTIONS FRAMEWORK**

Generics types, Collections Overview, The Collection Interfaces - The List Interface, The Set Interface - HashSet , TreeSet Map Interface- HashMap, TreeMap, The Collection Classes – ArrayList Class, HashSet Class.

**UNIT – V****[20%]****SWING FRAMEWORK**

The Origins of Swing, Two Key Swing Features, Components & Containers - Understanding Layout Managers – FlowLayout, BorderLayout, GridLayout, CardLayout, GridBagLayout, The Swing Packages, A Simple Swing Application, differentiate Swing & Applet, GUI Events-Event Delegation Model, and Exploring Swing Components.

**ANNOTATION IN JAVA**

What is Annotations,where we can use annotations? built-in annotations in java.

**Text Book(s):**

1. The Complete Reference Java, Herbert Schildt, TMH, Seventh Edition

**Unit wise Coverage from Text book(s):**

- Unit 1:** Chapter: 1,2,3,16(Page:386 to 398,415),18, 4,5,6
- Unit 2:** Chapter: 6 (Continue),7,8,9
- Unit 3:** Chapter: 13,19,15
- Unit 4:** Chapter: 10,11(Full)
- Unit 5:** Chapter: 17(Selected Topics),22,29,30

**Other Reference Books:**

1. Java Programming ,Hari Mohan Pandey,Pearson Publication
2. The Java Hand Book, Patrick Naughton, TMH, Eleventh Reprint, 2002

**Note: Practicals of Unit 1 should be developed using command prompt and Unit 2 onwards IDE like Eclipse or NetBeans can be used**

**Experiment List****UNIT-1:**

- Observe the interaction involved in the process of booking a bus ticket. Identify the various objects involved and the interaction between the objects in order to solve the problem of bus ticket booking.
- Demonstration of wrapper classes and the related data types
- Convert binary number to decimal equivalent and print it.
- Convert decimal number to binary equivalent and print it.
- Demonstration of logical, relational and shift operators.

**UNIT-2:**

- Write a program to make use of a parameterized method inside a class. Take the following case: Create a class Box and define a method in this class which will return the volume of the box. Initialize two objects for your class and print out the volumes respectively.
- Write a program to store values in one array, sort it and store it in another array.)
- Display both the arrays. (Write function for sorting. Apply Selection sort.)
- Write a super class called SquareArea with a method named area (double area) which calculates the area of square. Create one subclass calls CubeArea with an overriding method named area (double area) which calculates the area of cube.
- Write a program to calculate the simple interest and compound interest using abstract class as well as interface.
- Create Package for any one of the above programs or take a case study.

- UNIT-3:**
- Write a program that takes the marks of subjects from user, calculates the percentage and displays the result on screen. (Use I/O classes and its methods)
  - Write a program that will count the number of characters, words and lines present in a file.
  - Write an application that reads two different strings from two different files and write the concatenated string into another file. All file names must be given as command line arguments.
  - Taking a case study show the demo of various string methods using mutable and immutable classes.

- UNIT-4:**
- Write a program to sort the given set of integers in ascending order. Include a try block to find the array out of bounds exception and catch it.
  - Write a program to create a Student class. If the mark is greater than 100 it must create an exception called MarkOutofBounds Exception and throw it.
  - Write an application illustrating how a program can wait for threads to complete. The ThreadM class extends Thread class and displays a string every second for 10 iterations. The ThreadN class also extends Thread class and displays a string every two seconds for 20 iterations. The main( ) method creates and starts these two threads and displays a message after they have both completed.
  - Write an application that demonstrates two threads at different priorities showing the lowest and highest priority.

**UNIT-5:**

- Design a text editor similar to notepad using swing.
- Write java application using slider control to change the current Fahrenheit to centigrade and display the result in Jlabel
- Taking a case study show the use of all the components and containers

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 12: Web Development Technology**

#### **Rationale:**

- To develop basic knowledge of designing and developing client server architecture based web applications using Asp.Net with C#
- This course covers advanced topic in ASP.NET, so that student can develop any web based projects for the industry.

**Prerequisites:** HTML, Client-side scripting, Basic Asp.Net

#### **Learning Outcome:**

This Course Covers learning and implementation of -

- Web Application Architecture
- Server Controls, HTML Controls & CSS
- Master pages & Themes
- Working With AJAX
- Working With Database
- Securing Web Application
- ASP.NET Web Services

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#### **Course Contents:**

**Unit 1: Introduction to Client Server Architecture & Asp.Net Basics** (20%)

**Introduction to .NET Framework:** NET framework, Namespaces, Assemblies.

**An Introduction to ASP.NET:** Understanding HTML, A First Look at ASP.NET Markup

**A Tour of the IDE:** The Main Development Area, Informational Windows

**Building an ASP.NET Web Site:** Creating Web Sites, Working with Files in Your Web Site, Working with Web Forms.

**Designing Your Web Pages:** An Introduction to CSS, Working with CSS in Visual Web Developer

**Unit 2: Working with ASP.NET Controls & Programming (20%)**

**Introduction to Server Controls:** A Closer Look at ASP.NET Server Controls, Types of Controls, ASP.NET State Engine

**Introduction to Programming:** Data Types and Variables, Statements, Organizing Code.

**Creating Consistent Looking Web Sites:** Consistent Page Layout with Master Pages, Using a Centralized Base Page, Themes, Skins

**Unit 3: Advanced Controls (20%)**

**Navigation:** Using the Navigation Controls

**User Controls:** Introduction to User Controls, Adding Logic to Your User Controls,

**Validating User Input:** Gathering Data from the User, Processing Data at the Server,

**ASP.NET AJAX:** Using ASP.NET AJAX in Your Projects

**Unit 4: Introduction to Databases (20%)**

**Databases:** Using SQL to Work with Database Data, Creating Your Own Tables

**Displaying and Updating Data:** Data Controls, Data Source and Data-Bound Controls Working Together, Customizing the Appearance of the Data Controls, Updating and Inserting Data

**LINQ:** Introducing LINQ, Introducing LINQ to SQL

**Unit 5: Presenting Data (20%)**

**Advanced Topics:** Formatting Your Controls Using Styles, Handling Events, Caching

**Security:** Introducing Security, Introducing the Login Controls, Role Manager,

**Exception Handling:** Basics of Debugging, Tools Support for Debugging

**Deploying Your Web Site:** Preparing Your Web Site for Deployment

**Text Book:**

- Imar Spaanjaars, Beginning ASP.NET 3.5 In C# and VB, Wrox Publication

**Reference Books:**

- ASP.NET 4.0 Black Book, Dreamtech Press
- Mastering Visual Basic 2008 – Evangelos Petroutsos, Wiley India.
- ASP.NET Website Programming: Programs - Design – Solution
- ASP.NET in a Nutshell
- Teach Yourself ASP.NET in 24 Hours

**Practical Programs:**

1. Develop a Registration page using standard controls and validation controls a.

Use of radio button, dropdown and combo box is needed

- b. Validation to be applied in every control
- 2. Create a Registration page and store the details in the database
- 3. Create a login page and change password page and update the details in the database
- 4. Develop an admin page, in which admin can able to a.
  - Add new product details
  - b. Edit product details c.
  - Delete any product
  - d. Display the details in the gridview
- 5. Display the product details in the gridview
  - a. Gridview should be sorted according to the products b.
  - Paging should be applied in the gridview
  - c. Grid rows should be applied with alterative colors
- 6. Create a Master page and combine Registration, login, change password and product pages to be included in the master page. User should able to access any page simultaneously.
- 7. Display a gridview which displays the details from the database and allow gridview to perform edit, delete and insert through the grid.
- 8. Develop an application to create user profile and allow the user to update the profile.
  - Once you get the input data from the user, the profile data to be displayed in the correct format for the user to get printout with user image.
- 9. Create an application form in vb.net to store user's information also validate the information to display the error message for certain criteria like:
  - a. User exceeds max length b.
  - If the field is blank
  - c. User has entered a numeric in place of char/ vice-versa. d. If info is valid it should store the details in the database.
  - e. Users should able to display the list of all users' residing in a particular city in a data grid
  - f. User should also able to edit or to delete a particular user.
- 10. Implement AJAX control in Asp.Net web application
- 11. Use LINQ queries to access the database from Asp.Net web application.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 13:Advanced Database Management System**

#### **Course Description:**

The primary objective of this course is to provide in-depth knowledge of the Advance concepts database management system: DDBMS, DW and back end programming through PL/SQL.

#### **Prerequisites:**

- Knowledge of centralized database management system, DBMS concepts, SQL

#### **Learning Outcomes:**

Students will learn Five components like DDBMS, Data Warehousing and Introduction to PL/SQL, Basic features of PL/SQL, Data retrieval and Exception handling in PL/SQL, Creating and managing named PL/SQL blocks (Procedure, function, package and triggers) and Advanced features of PL/SQL at the end of this course, which are as under:

- In “DDBMS”, they will understand concepts like distributed database processing, DDBMS architecture, Distributed database design, overview of query optimization and overview of transaction control in DDBMS.
- In “Data Warehousing”, they will understand concepts like DW architectures, important components, multidimensional, OLAP operations and enhancement of Group by clause in SQL for OLAP operations.
- In “PL/SQL”, they will understand three tier client/server application models and need of PL/SQL.
- In “Basic features of PL/SQL” they will practice and implement block structure of PL/SQL, variable declaration, datatypes and operators in PL/SQL, etc.
- In “Data retrieval and Exception handling in PL/SQL” they will practice and implement how to retrieve data using cursor and how errors are handled in PL/SQL.
- In “Creating and managing named PL/SQL blocks” they will practice and implement how to create and use Procedures, Functions, Packages and Triggers.
- In “Advanced features in PL/SQL” they will practice and implement how to create and manage bulk binds and the functionalities of dbms\_SQL package.
- All these concepts are important to build their career as Back-End Developer, Database Programmer, and Back End API developer.

#### **Teaching and Evaluation Scheme:**

The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
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5	3	4	25	25	50	50	150

### Course Contents:

#### UNIT-I : Introduction to DDBMS

[20%]

What is DDBMS? -Distributed Data Processing, Defining Distributed Database System, Promises of DDBMS, Complicating Factors, and Problem Areas. DDBMS Architecture: Client/Server Systems, Peer-to-Peer Distributed System and Multi-DBMS Architecture (MDBS).Distributed Database Design: Design strategies, design issues, basics of fragmentation and allocation. Basics of Query Optimization in DDBMS, Overview of Transaction Management and Concurrency Control in DDBMS.

#### UNIT-II Introduction to Data Warehousing

[20%]

Data Warehouse Definition with clear understanding of the four key-words appearing in it. Differences between Operational Database Systems and Data Warehouses; Difference between OLTP & OLAP. Data warehouse Architecture, Overview of Multi-dimensional Data Model (Star, Snowflakes and Fact Constellations Schema), and the basic differentiation between “Fact” and “Dimension”; OLAP Operations in Multi-dimensional Data Model: Roll-up, Drill- down, Slice & Dice, Pivot (Rotate),Type of OLAP Servers: ROLAP versus MOLAP versus HOLAP, Metadata of DW. Enhancement to Group by clause: Group by using Cube and Rollup.

#### UNIT-III : Introduction to PL/SQL

[20%]

Why PL/SQL?, Features of PL/SQL, Application models and PL/SQL, PL/SQL basic block structure, Language fundamentals: Lexical Units, Variable declaration, PL/SQL datatypes, Expressions and Operators, PL/SQL Programming construct: PL/SQL control structures, PL/SQL records, SQL within PL/SQL : DML in PL/SQL.

Data retrieval using Cursor: Explicit and Implicit cursor, cursor fetch loops and cursor variables.

#### UNIT-IV : Creating and handling Errors and Named PL/SQL Blocks

[20%]

Error handling: Declaring and Handling exceptions, Raising Exceptions, The EXCEPTION\_INIT pragma, Using RAISE\_APPLICATION\_ERROR statement, Exception propagation. Creating subprograms Procedures and Functions, Procedures versus Functions, Local subprograms and stored subprograms. Database Triggers : Types of triggers, Managing Triggers.

#### UNIT-V : Advanced Features in PL/SQL

[20%]

Creating Packages: Package specification and package body, Packages and Scope, Overloading packaged subprograms, Package Initialization, overview of collections.

Language Features: Native dynamic SQL, Bulk binds, Bulk COLLECT and RETURING INTO clause, DBMS\_SQL package.

**Text Book(s):**

1. Principles of Distributed Database Systems. Ozsu and Valduriez. Prentice Hall.
2. DATA WAREHOUSING FUNDAMENTALS, PAULRAJ PONNIAH A Wiley-Interscience Publication JOHN WILEY & SONS, INC. New
3. "Oracle 9i PL/SQL Programming", Scott Urman, Oracle Press.
4. "SQL,PL/SQL The programming language of oracle", 3rd revised edition, Ivan Bayross, BPB Publication

**Reference Books:**

1. Professional Oracle Programming, by Rick Greenwald, Robert Stackowiak, Gary Dodge, David Klein, Ben Shapiro, Christopher G. Chelliah, Wiley Publication
2. Sams Teach Yourself PL/SQL in 21 Days
3. Oracle9i: The Complete Reference , by Kevin Loney, George Koch , Oracle Press
4. Programming with PL/SQL for beginners, Hiren Dand, Rajendra Patil, Tushar Sambare, SDP
5. DISTRIBUTED DATABASE MANAGEMENT SYSTEMS :A Practical Approach, by SAEED K. RAHIMI and FRANK S. HAUG, A JOHN WILEY & SONS, INC., PUBLICATION
6. Data Mining Concepts and Techniques Third Edition Jiawei Han University of Illinois at Urbana-Champaign Micheline Kamber Jian Pei Simon Fraser University

**List of practical based on** Designing and implementing database programming based on Case Study.

1. Design and implement star schema and snowflake schema.
2. Analytical SQL query using cube and rollup
3. Simple PL/SQL Blocks
4. PL/SQL Blocks using built-in functions
5. PL/SQL Blocks using cursors
6. PL/SQL Blocks for Error Handling
7. Stored Procedures
8. Stored Functions
9. Triggers
10. Packages and usage of in-built packages
11. Workshop based on other databases: Postgrace etc.

**Unit wise coverage from text book(s):**

- UNIT 1: Text Book 1, Ref Book 5  
UNIT2: Text Book 2, 3, Ref Book 6  
UNIT3: Text Book 3  
UNIT4: Text Book 3  
UNIT5: Text Book 3

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 14:Advanced Networking**

#### **Rationale:**

- To give the understanding of the functionality of each layer of TCP/IP model and interactions between them.
- To give the understanding of the functionality of UDP and TCP Protocols.
- To describe the working of routing algorithms and its techniques.
- To Enhance the knowledge of networking in wireless scope and its security as well

**Prerequisite:** Basic concepts of network communication such as ports, topologies, Categories of Networks, Physical Media, Switch, Router, Hub, Bridges, Gateway, Repeater etc.

#### **Learning Outcomes:**

At the end of the course, student will be able to:

- Create a small network - wired as well as wireless
- Understand the IPv4 and IPv6 addresses
- Understand the essentials and working of protocols like DHCP, DNS, FTP, TFTP etc.
- Develop network specific programs

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test,

Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
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	Th	Pr	Th	Th	Th.	Pr.	
4	3	2	25	25	50	50	150

#### **Course content:**

##### **Unit 1: Basics of Networking [15%]**

Categories of Networks: Local Area Network, Wide Area Network, Metropolitan Area Networks, OSI Reference Model, TCP/IP Model

##### **Unit 2: Internet Protocols & ICMP [25%]**

**IP Addressing:** IP4 and IP6, IP Address, Class full Addressing, Connectionless Datagram Delivery, Forwarding IP Datagram, Routing table,

**ICMP:** ICMP protocol, ICMP Message format

**Unit 3: CIDR, UDP and TCP****[20%]**

**CIDR:** Subnet Addressing, Subnet mask representation, Classless Addressing

**UDP and TCP:** UDP Message Format, UDP Pseudo Header, Ports, End Points, Passive and

Active opens, Segments, TCP Options, Karn's Algorithm, Congestion, TCP State machine, Silly window syndrome

**Unit 4: VPN, DNS and TCP protocols****[25%]**

Virtual Private Network (VPN), Domain Name System (DNS), Name to IP Address Mapping and vice-versa, World Wide Web(WWW) Service, BOOTP, Dynamic Host Configuration Protocol(DHCP), Lease Mechanism, Planning, DHCP Environment, DHCP State machine, TELNET, FTP Services, TFTP, Simple Mail Transfer Protocol (SMTP), POP3, Internet Message Access Protocol (IMAP), Multipurpose Internet Mail Extensions (MIME), Mobile IP

**Unit 5: Internet security****[15%]**

Introduction to IPsec and SSL, Need for Security, IPSec, Authentication Header (AH), Security Association (SA), Encapsulating Security Payload (ESP), Authentication and mutable header fields, Tunneling, Required security algorithms, Secure Sockets (SSL and TLS), Firewalls, Firewall implementation issues, Monitoring and logging

**Text Book(s):**

1. Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (5th Edition) by Douglas E. Comer, Prentice Hall
2. Behrouz A. Forouzan, "Data Communications and Networking", Tata McGraw-Hill, Fourth Edition

**Other Reference Books:**

1. Computer Networks, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall.
2. TCP/IP Protocol Suite forth Edition, TMH, Behrouz A. Forouzan
3. TCP/IP Illustrated volume -1 Second Edition The Protocols by kevin R. Fall and W Richard Stevens. Pearson Pub.
4. CCIE Professional development, Routing TCP/IP Vol. 1 second edition Cisco publication Jeff doyle, jenifer Carroll.

**Unit wise coverage from text book(s):**

UNIT 1: Book 2 and Reference Book 1

UNIT2: Ch. 4, 6, 7, 8

UNIT3: Ch. 9, 11, 12

UNIT4: Ch. 18, 19, 22 - 27

UNIT5: Ch. 30

**Practical List:**

1. Write a program to implement TCP Socket, with two-way communication only once. (Non-GUI).
2. A program to implement simple UDP Client and Server.
3. Write a client / server socket program in which the server echoes the message sent by the client. (Non-GUI).
4. Server returns the current date and time to the client. (Non-GUI).
5. A java program in which server computes the factorial of the number, given by the client. (Non-GUI). (Can be extended to all the logics of earlier programming languages like C and C++).
6. A program to implement the concept of chatting between the two clients.
7. A program to implement the Inet-Address. Give the IP-Address in command line.

8. A Non-GUI program to send different “Quote of the Day” to every client when connected.
9. A program running server socket to validate the user and password information given by the client at command line.
10. A java routine to implement the concept of Broadcasting.
11. A java routine to implement the concept of Multicasting.
12. A java routine to implement the concept of Single Client connects to one server available from multiple servers using multi-threading.
13. A Non-GUI based program to implement the FTP (File Transfer Protocol). Filename given by command-line, should be transferred to the Server’s machine.
14. A Non-GUI program to implement TELNET. You first login then give the commands which you have decided. According to the commands, desired output should be available on the client’s screen. Implement Dir, Date, Time, Hello, Exit commands.
15. Non-GUI program to implement ARP (Address Resolution Protocol) (means ping facility). Give IP address from client side and check the existence of the server at given IP address. If server exists, then give positive reply otherwise after some time; raise error of time out (Four times).
16. A GUI-based program to implement DNS (Domain Name Services). Server keeps track on all available clients and their addresses (Name with IP: port). When Client gives a request for other client using name, Server checks the existence of the same and if available, connects both the clients or just replies with intended client’s IP address and Port.
17. A program to implement HTTP server’s GET method.

**Note: Perform all the above practical using Java Socket Programming without use of IDEs**

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 15: Programming using Open Source**

**Rationale:** This course introduces core programming basics—including data types, control structures, algorithm development, and program design with functions—via the Python programming language. It also covers the fundamental principles of Object-Oriented Programming and Graphical User Interface.

**Prerequisite:**

- Knowledge of Programming languages such as C, C++, JAVA and .NET
- Analysis of coding complexities.

**Learning Outcomes:**

Students will learn to program in interactive mode with lot of time saving in development resulting in lesser developmental cost by

- Applying decision and repetition structures in program design.
- Implementing methods and functions to improve readability of programs
- Demonstrating the use of Python lists and dictionaries
- Describing and applying object-oriented programming methodology with GUI Programming

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**Course content:**

**Unit I: Basics of Python**

**[20%]**

Introduction to Python, Components of the Python language System, Using Python in interactive mode with basic operations and built-in functions, Reading input from the console, Identifiers, Variables, Assignment Statements and Expression, Named Constants, Numeric Data types and Operators. Common Python functions, Objects & Methods, String Functions, Formatting Numbers and Strings.

**Unit II: Programming Basics**

**[20%]**

Control Flow- if, if-elif-else, for, while, break, continue, pass. Functions: Defining and Calling Functions, Functions with/without return values, Positional and keyword arguments, Passing arguments by reference values. Keyword Arguments, Default Arguments, Variable-length arguments, Scope of the Variables in a Function - Global and Local Variables. Dates and Times Functions - Creating Dates and Times, Dates Arithmetic, Modules and Packages.

**Unit III: Programming Advance Features****[20%]**

**Lists** : List Basics, Copying Lists, Passing Lists to functions, Returning a list from a function, Searching list, Sorting list, Processing Two-Dimensional lists, Passing Two-Dimensional lists to functions. **Tuples**: Tuples, Accessing tuples, Operations, Functions. **Sets** : Accessing values in sets, Operations, Functions. **Dictionaries**: Accessing values in dictionaries, Operations, Functions.

**Unit IV: Object Oriented Programming, Exceptions & Database****[20%]**

**OOP in Python**: Classes, 'self variable', Methods, Constructor, Inheritance, Overriding Methods, Data hiding, **Handling Exception**: try except block, Raising Exceptions, User Defined Exceptions.

**Database**: Database Connection, CRUD Operations.

**Unit V: GUI Development****[20%]**

**GUI Development**: Getting started with Tkinter, Processing Events, The Widget classes, canvas, The Geometry Managers, Displaying Images, Menus, Popup Menus, Mouse, Key Events and Bindings, Standard Dialog Boxes, MVC Architecture.

**Text Books:**

1. Introduction to Programming Using Python, Y. Daniel Liang, Pearson Publications
2. Practical Programming - an Introduction to Computer Science Using Python by Jennifer Campbell, Paul Gries, Jason Montojo, Greg Wilson.

**Reference Books:**

1. Fundamentals of Programming Python by Richard L. Halterman.
2. The Quick Python Book, Vernon L. Ceder, Manning Publications
3. Python and Tkinter Programming, John E. Grayson, Manning Publications

**Chapters as per Units**

Unit I: Chapters 2, 3

Unit II: Chapters 4, 5, 6

Unit III: Chapters 10, 11, 14

Unit IV: Chapters 12, 13.6 – 13.9, (From Book 2 - Pg 339 – 360)

Unit V: Chapter 9

**Practical List**

1. Write a program that asks the user about textbook prices and reports how overpriced the textbooks are. (You may wish to read this number from the user with the input command. You can round numbers with the round command.)
2. Create a program that outputs the total cost of a lunch order. Users should be prompted to input the number of hamburgers, fries, and drinks they want and the program should print the total cost of the order. The hamburgers cost 2.00, fries cost 1.50, and drinks cost 1.00. Be creative and professional in prompting the user for the information and in displaying the output.
3. Write a Python program that prompts the user for the cost of two items to be purchased. Then prompt the user for their payment. If they enter an amount that is less than the total cost of the two items, print a message that tells them how much they still owe. Otherwise, print a message that thanks them for their payment and tells them how much change they will receive. Thoroughly test your code for all possible input.
4. Create a program which will allow the user to enter the state of two switches (either 1 (on) or 0 (off)). The program should work out if both switches are on and then output the message 'the light is on'. Otherwise, the program should output the message 'the light is off'.
5. Create a program that will keep track of items for a shopping list. The program should keep asking for

new items until nothing is entered (no input followed by enter/return key). The program should then display the full shopping list.

6. Write a program that will store the schedule for a given day for a particular TV station. The program should ask you for the name of the station and the day of the week before asking you for the name of each show and the start and stop times. Once the schedule is complete it should be displayed as a table.
7. Write a program that maps a list of words into a list of integers representing the lengths of the corresponding words.
8. Create a function with signature: `integer(number)` The number parameter is either a number or a string that can be converted to a number. The function should return the number as type int, rounding it if the number passed in is a float. If the conversion fails, catch the `ValueError` exception, and return 0. Make sure it works for both strings and literal numbers, such as 4.5, 32, "23", and "-15.1", and that it correctly returns zero for invalid numbers like "tonsils".
9. Write a program to check whether an element „y“ and „a“ belongs to the tuple  
`My_tuple=(„p“, „y“, „t“, „h“, „o“, „n“)` and after Printing the result, delete the tuple.
10. Write a python program named Weather that is passed a dictionary of daily temperatures, and returns the average temperature over the Weekend for the weekly temperatures given.
11. Write a program to catch a Divide by zero exception. Add a finally block too.
12. Generalize a case study on the getting the students mark statements and analysis with exception handling.
13. If you ever find yourself buying a house, you'll want to know what your monthly payment for the loan is going to be. Write a complete program that asks for information about a loan and prints the monthly payment. The formula for computing monthly mortgage payments involves the loan amount, the total number of months involved (a value we call  $n$ ) and the monthly interest rate (a value we call  $c$ ). The payment formula is given by the following equation:

$$\text{payment} = \text{loan} \frac{c(1+c)^n}{(1+c)^n - 1}$$

14. Write a set of classes corresponding to the geometric shapes: cube, rectangle, cone and cylinder. Each class should have a constructor that allows for the creation of different sized objects (e.g., a cube is specified by the length of its side) and a method that return the area of the shape.
15. Write a procedure that evaluates polynomials. It should take two arguments. The first is a number  $x$ . The second is a list of coefficients ordered from highest to lowest:

$$a_n, a_{n-1}, \dots, a_2, a_1, a_0$$

Your procedure should return the value of the polynomial evaluated at  $x$ :

$$a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

16. Write a python program to design simple calculator performing arithmetic functions like addition, subtraction, multiplication and division with the input given by user
17. Write a dialog style application in python that calculates compound interest.  
The amount should be automatically recalculated every time the user changes one of the variable factors, i.e., the principle, rate, or years. The years combobox should have the texts "1 year", "2 years", "3 years", and so on, so the number of years will be the combobox's current index + 1. The compound interest formula in Python is `amount = principal * ((1 + (rate /100.0)) ** years)`. The `QDoubleSpinBox` class has `setPrefix()` and `setSuffix()` methods which can be used for the "\$" and "%" symbols.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester I**

### **MCA - 16: Mini Project-I**

#### **Rationale:**

The students would be developing an application on Desktop Publishing, Film Making, HTML Website Designing, 3D animation, Small Project with business aspects (Retail, Import Export, HR, etc) utilizing relevant programming development environment / software development environment. The domain of the project can include case study analysis, near to industry projects.

#### **Learning Outcomes:**

At the end of the project students will be able to understand the importance of Analysis, Logic building and programming, which would be of great help in developing a near to real life project in the later semesters.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
1	1*	2	-	50	-	-	50	

**Instructional Strategies:** Theory sessions for mini project -1 would acquaint students with the basic concepts of developing a project utilizing the concepts of software engineering and object oriented design (including UML). Practical sessions allotted for mini project -1 would ensure that the students undergo sincere work under the guidance of faculty members.

#### **Criteria for Evaluation of Software Projects**

Project Definition:	10%
Related project Study Analysis:	70 %
Design & Development:	20%

# **SEMESTER – II**

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 21: Advanced Object Oriented Technology**

#### **Rationale:**

The objective of this course to teach the concept of J2EE so they can easily development the application using Servlet, JSP , JDBC and other concept. Instruction shall be in a laboratory setting with continuous hands-on implementation of concepts and emphasis on developing application in AJP.

**Prerequisite:** Basic knowledge of Object Oriented Programming Language (Core Java)

#### **Learning Outcomes:**

Students will be able to develop the database driven enterprise application using the subjects concepts.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

**UNIT 1 :SERVLETS** [20%]  
Building basic servlets, Understanding the Servlet life cycle, Reading form parameters, Using HTTP request headers, Manipulating HTTP status codes and response headers, Redirecting requests, Generating custom JPEG images from servlets, Handling Cookies, Tracking sessions, Difference between browser and server sessions,Advanced features of Servlet.

**UNIT 2 JDBC** [20%]  
Overview of JDBC , Understanding of ODBC , JDBC driver types, JDBC-ODBC bridge , Driver Manager , Driver , Connection , Statement , ResultSet, Accessing databases with JDBC, Configuring MS Access, MYSQL and Oracle9i , Creating and Processing HTML Forms

**UNIT 3 JSP FUNDAMENTS****[20 %]**

Overview of JSP, Invoking Java code from JSP pages, Classic JSP scripting elements, Predefined JSP variables, Code structure with the page directive, Controlling multithreading behavior , Pages at request time and compile time , Including Files and Applets in JSP pages

**UNIT 4 MVC ARCHITECTURE AND JSTL****[20%]**

Understanding the benefits of beans, Creating beans, Installing bean classes on server, Accessing bean properties, Setting implicit and explicit bean properties, Sharing beans among multiple servlets and JSP pages, Understanding the benefits of MVC, Request Dispatcher to implement MVC, Handling relative URLs, Different display options, Comparing Data Sharing strategies, Collections and Implicit Objects Using EL, Using EL Operators. The Application Events Framework, Tag Library – Basics; Using JSTL – c:out, c:forEach, c:forTokens, c:if, c:choose, c:set, c:remove, c:import, c:url, c:param, c:redirect and c:catch Tags

**UNIT 5 SPRING AND ORM****[20%]**

What is spring? Spring architecture, dependency injection , Aspect oriented programming, Spring Boot Framework features, spring boot configuration and sample project, SB Annotation, SB properties , Spring Boot by creating a REST Web App, Introduction to hibernate and JPA, Database with SB using JPA

**Text Books:**

1. Marty Hall, Larry Brown, “Core Servlets and JavaServer Pages Volume – 1”, Pearson
2. Marty Hall, Larry Brown, “Core Servlets and JavaServer Pages Volume – 2”, Pearson
3. Craig Walls “Spring Boot in Action” manning publication

**Chapter & Topics –****Book 2:-**

Unit 4: 7, 9

**Book 1:-**

Unit 1: 2, 3,4,5,6,7,8,9

Unit 2: 18,

Unit 3: 10,11,12,13

Unit 4: 14, 15

**Reference Book:**

1. Java Servlet & JSP CookBook , Bruce W. Perry , O'Reilly.
2. J2EE: the complete reference , James Edward Keogh , McGraw-Hill
3. Java database programming bible, John O'Donahue, Wiley
4. Java How To Program- Eighth Edition, Paul Deitel & Harvey Deitel, PHI Publication

**Note: Practicals Can be performed using any of IDE like Eclipse or NetBeans.**

**Experiment List:****UNIT-1:**

- Develop interest calculation application in which user will provide all information in HTMLform and that will be processed by servlet and response will be generated back to the user.
- Develop an application to demonstrate how the client (browser) can remember the last time it visited a page and displays the duration of time since its last visit. (Hint: use Cookie).
- Demonstrate the use of request and response headers .

**UNIT-2:**

- Develop a program to perform the database driven operation like insert, Delete, Update and select. To perform the above operations create one table named Employee.
  - Field Name Field Type
  - EmpId Integer
  - Empname Varchar
  - Emp\_desig Varchar
  - Emp\_J\_Date Varchar
  - Emp\_Salary Numeric
- Develop a Java application to perform the database driven operation like insert, Delete, Update and selection using PreparedStatement. To perform the above operations use the table from above exercise.
- Write a Java application to invoke a stored procedure using a CallableStatement. For this a
  - stored procedure called incrementSalary may be developed to increase all the employees salary
  - by a percentage specified in the parameter.

**UNIT-3:**

- Write a simple JSP page to display a simple message (It may be a simple html page).
- Write a JSP page, which uses the include directive to show its header and footer.
- Develop an application to write a "page-composite" JSP that includes other pages or passes control to another page. (Hint: Use <jsp:include> or <jsp:forward>).
- Reduce the amount of Java coding in your JSP using a JavaBean component. (Hint: Use <jsp:useBean> with the name of your bean).
- Write a JSP Page to use JSP's Page directives & JSP scripting.
- Write a JSP Page to which uses Session Tracking for online shopping.

**UNIT-4:**

- Write a JSP page which uses tags available from the standard tag library JSTL. Write a Servlet which uses the concept of Request forwarding & including external source in the current servlet context.
- Develop a JSP Page to display the personal information and result information of the student in two different tabular formats.
- Develop a JSP Page to perform database driven operations like insert, Delete, Update and selection with table named Student having fields like StudId, Name, Address, result.

**UNIT-5:**

- Create web application using spring boot
- Demonstrate the use of REST service using SB.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester- II**

### **MCA - 22: Open Source Technology**

#### **Rationale:**

This Course guides the students to – work with core PHP and MySQL, Create blog and website using Wordpress and develop application using Laravel framework.

- Furthermore, this course helps students in creating & handling HTML forms, Creating databases and tables and Inserting records in MySQL, Creating custom error handlers, PHP and MySQL debugging techniques, Setting & accessing cookies & session variables, Upload a file in PHP, Create the advanced PHP scripts and works with MVC architecture.

#### **Prerequisites:**

- Working knowledge of Internet and HTML, CSS, JavaScript.

#### **Learning Outcome:**

- The purpose of this course is to give students an understanding of Client/Server architecture with their application tools.
- The course provides an introduction to the development of client server technologies based web applications using PHP, MySQL, and Apache.
- The course will focus on the PHP programming language. This course also provides how to configure and use CMS and allows working with Php framework using MVC architecture.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

##### **Unit 1: Introduction to PHP, Control Structures, Arrays and Functions:** [20%]

**Application:** To understand the basics of PHP and MySQL

**Introducing PHP:** Why PHP and MySQL

**Side Scripting Overview:** Static HTML, Client-Side Technology, Server-Side Scripting and Escaping from HTML

**Learning PHP Syntax and Variables:** PHP's Syntax, Comments, Variables, Types in PHP, Type Summary, The simple types, Output

**Page No: Book 1: 3 to 18, 28 to 32, 33 to 57**

##### **Unit 2: Features of PHP** [20%]

**Application:** To understand the major features needed to work with php applications

**Php Control Structures and Functions:** Boolean Expression, Branching, Looping and Using functions.

**Passing Information with PHP:** HTTP is Stateless; GET and POST Arguments, Formatting Form Variables.

**String Handling:** Strings in Php, String Functions

**Learning Arrays:** Php Arrays, Creating arrays, Retrieving values, multidimensional arrays, inspecting arrays, deleting arrays

**Number Handing:** Numerical types, Mathematical operators, mathematical functions

**Page No: Book 1: 59 to 140, 153 to 159**

**Unit 3: MySQL Database Integration and Query Processing and Web Forms:** [20%]

**Application:** To understand and implement MySql database with Php

**Introducing Database and MySQL:** Integrating PHP and MySQL: Connecting to MySQL, Making MySQL Queries, Fetching Data, Multiple connections, Building in error-checking, Creating MySQL database with PHP, MySQL functions.

**Performing Database Queries:** HTML Tables and Database Tables, Complex Mapping.

**Integrating Web Forms and Databases:** HTML Forms, Basic Form Submission to a Database, Self-Submission, Editing Data with an HTML Form

**Page No: Book 1: 185 to 188, 219 to 277**

**Unit 4: Advanced PHP and PHP CMS:** [20%]

**Application:** To understand and implement the concept of cookies and sessions. To create blogs and websites using WordPress

**Working with Cookies and Sessions:** What is a Session? How Session works in PHP, Session Functions, Cookies.

**Exception with PHP:** Error Handling in PHP.

**WordPress:** About WordPress: Why WordPress? Sites Built with WordPress, Installing and Upgrading WordPress, Dashboard and Settings

**Working with Content:** Post, Pages, Posts vs. Pages, Media Files, Links, Feeds

**Importing Content:** Importing Blogs, Importing HTML Files, Creating a Basic Theme.

**Page No: Book 1: 409 to 427**

**Book 2: 1 to 171**

**Unit 5: PHP Framework:** [20%]

**Application:** To learn and implement php framework using Laravel

**Laravel – What is Laravel?** Installation

**Quick start: Creating your first web application:** Database configuration, Creating the users table using migrations, Creating an Eloquent user model, Routing to a closure, Creating users with Eloquent, The users controller, Creating the users index view, Passing data from a controller to a view, Adding our dynamic content to the view, RESTful controllers, Creating a form for adding users, Routing POST requests to a controller action, Receiving form input and saving to the database, Creating links with the HTML helper, Deleting user records with Eloquent, Updating a user with Eloquent, Creating the update form with the form helper

**Top 5 features you need to know about:** Eloquent relationships, Authentacatin, Filters, Validataions, Bundles

**Page No: Book – 3: 3 to 43**

**Text Book(s):**

1. PHP 6 and MySQL 6 Bible –Steve Suehring, Tim Converse and Joyce Park – Wiley Publication
2. Beginning wordpress 3 by Stephanie Leary – APRESS Publication
3. Laravel Starter, Shawn McCool, PACKT Publication

**Reference Books:**

1. PHP and MySQL Web Development – Luke Welling, Laura Thomson – Pearson
2. Laraval Up & Running by Matt Stauffer – O'Reilly Publication

**Practical Questions:**

1. Write a program that formats a block of text to be inputted by the user, based on the performances chosen by the user. Give options for color, font and size and display the output.
2. Create a web page and execute a PHP file on submission of the form and display the information using PHP.
3. Create an application that validates the proper email address and turns it into a link.
4. Include the user profile application, where user has to pass all validations.
5. Write a PHP program to perform all string operations available in php
6. Write a PHP program to perform Date functions function available in php
7. Write a PHP program to perform all the Math functions available in php
8. Write a PHP Program to perform Array operations like,
  - Print the values of array.
  - Reverse an array.
  - merge two arrays in sorted manner.
  - add values of all elements of an array.
9. Write a PHP program to display current date and time and display Good Morning / Good Afternoon/ Good Evening message according to current time.
10. Create an application to create a cookie, access a cookie and destroy the cookie.
11. Set a session after user's login; maintain the user's data with session. Destroy the session and its data after a period of time.
12. Build an authentication application and restricts the unauthorized user from loading the page. And redirect the page with appropriate message.
13. Develop an application which stores student's info with following fields rno, name, city, gender, percentage. Provide the following facilities like:
  - Search by city
  - Search by Gender
  - Display max and min percentage.
14. Write a program to calculate total weekly pay. If the user enters the number of hours worked and selects the hourly rate of pay from a list box. If overtime has been done, the number of hours is also entered. Over time hours are paid at double rate. A check box displays overtime. Calculate total amount to be paid.
15. Develop an application to add the movie name currently running with following operations:
  - To see all the favorite movie
  - To view top 5 and 10movies
16. Create an application which displays the info about a particular institute which enables the user to see the faculty list according to department.
17. Create an application that keeps track of how many times a visitor has loaded the page.
18. Write a program to do the paginating function to allow the user to go to the first page / last page like, <Prev [1] [2] ..... [10] Next>

19. Write a PHP program to calculate interest for loan using user defined class 'loancalculator'.
20. Write a program for online merchants with following operations:
  - Customer login for further transactions
  - Validates the customer's information
  - System should protect customer's information
21. Develop an application for a shopping cart with following operations:
  - Manage and display the catalog
  - Add, Update and delete the products
  - Process the shipping info
  - Stores the order info
  - Display the summary
22. Display the most popular item to your customer which is purchased the most? If the item is in top 5 display the description to the customer.
23. Create a database application for social gathering containing
  - Information about the location (eg: club house, Party venue)
  - Facilities available in the venue
  - Booking for the specific events
  - Display the booking details for current month and also generate the report for the bill to be paid for a particular booking
24. Create a blog using WordPress
25. Develop CRUD implementation using Laravel

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 23: Optimization Techniques**

#### **Rationale:**

The primary emphasis of the course is to introduce the important optimization techniques of Operations Research applied in the Industry, Economy, Business, Resource Allocation, Finance, Marketing, Simulation and Network Analysis. Optimization techniques use mathematical, computational, and scientific methods for making decisions to solve real life optimization problems.

#### **Prerequisites:**

Knowledge of Computer Oriented Numerical Methods and Statistical Methods.

#### **Learning Outcome: Students will**

- Acquire adequate knowledge with mathematical and computational modeling of real decision-making problems, including the use of modeling tools and computational tools, as well as analytic skills to evaluate the problems.
- Identify and develop operational research models from the verbal description of the real system.
- Enhance knowledge of different Operation Research Techniques of strategic decision planning for optimum utilization of constraint resources in various span of human life viz. industry, business, commerce, administration, management, service supply, maintenance, agriculture, medicines and healthcare, defense etc.
- Gain deep knowledge of purpose, importance and applications of optimization techniques of Operation Research and will be able to design and construct suitable optimization models to solve real life strategic problems and issues.
- Increase their capability to acquire sound knowledge of the algorithmic approach, real life operational issue solving approach rather than theoretical side.
- Be facilitated in such a way that they will be able to use tools like MATLAB, Scilab, MS Excel, Minitab to implement and apply various optimization techniques.

Sub Total Credit	Teaching scheme		Examination scheme					
	(per week)		MID	CEC	External		Total Marks	
	Th	Pr	Th	Th	Th	Pr		
<b>3</b>	<b>3</b>	-	<b>25</b>	<b>25</b>	<b>50</b>	-	<b>100</b>	

#### **Course Contents:**

##### **UNIT – I: Basics of Operations Research and Linear Programming Problem [20%]**

Introduction of Operation Research, definitions, features, advantages and applications, Linear Programming Problem (L.P.P.), Mathematical definition of a L.P.P. with its components: objective function and constraints, optimal solution, slack, surplus and artificial variables, Graphical method, Simplex method (Maximization case)

##### **UNIT – II: Linear Programming Problem and Sequencing Problem [20%]**

Simplex method (Minimization case), Two Phase Method, Big – M method , Introduction of Job Sequencing, Notation, Terminology and Assumptions, Johnson's algorithm for processing  $n$  jobs

through **2** machines, Johnson's algorithm for processing **n** jobs through **3** machines, Johnson's algorithm for processing **n** jobs through **m** machines, Processing **2** jobs through **m** machines using graphical method.

(Exclude: Dual Problem and Revised Simplex Methods)

### **UNIT – III: Transportation Problem**

**[20%]**

Introduction of Transportation problem (T.P.), Mathematical Models of T.P., Method to find initial basic feasible solution, North-West Corner Method(NWCM), Least Cost Cell Entry Method(LCM), Vogel's Approximation Method(VAM), Test of optimality for finding an optimum solution – MODI method, Variations in Transportation Problem (Unbalanced supply and demand)

(Exclude: Degeneracy resolution, Alternative Optimal Solution Prohibited transportation routes)

### **UNIT – IV: Assignment Problem (A.P.)**

**[20%]**

Introduction of Assignment Problem (A.P.), Mathematical Models of an Assignment Problem, Method to find an optimum solution - Hungarian Method, Variations of the Assignment Problem: Multiple optimal solutions, Maximization case, Unbalanced Assignment Problem, Restrictions on Assignments

### **UNIT – V: Project Management (PERT and CPM)**

**[20%]**

Introduction of Project Management, basic difference between PERT and CPM, Network Concepts, Components, Rules for Network Construction, Critical Path Analysis (Forward Pass, Backward Pass, Critical Path)

#### **Text Book(s):**

1. J. K. Sharma, "Operations Research – Theory and Application", 4th Edition, Macmillan Publishers India Ltd.

#### **Other Reference Books:**

1. Operations Research :  
Author(s): M.V. Durga Prasad  
Publication: Cengage Learning India Pvt. Ltd.
2. Operations Research – Principles and Practice :  
Author(s): Pradeep Prabhakar Pai  
Publication: Oxford University Press
3. Operations Research – Problems & Solutions :  
Author(s): V. K. Kapur  
Publication: Sultan Chand & Sons, New Delhi
4. Operations Research :  
Author(s): Kanti Swarup, Gupta P.K. , Man Mohan  
Publication: Sultan Chand & Sons, New Delhi
5. Operations Research :  
Author(s): N.K. Tiwari, Shashi K. Shandilya  
Publication: Prentice - Hall of India Pvt. Ltd.
6. Operations Research – An Introduction :  
Author(s): Hamdy A. Taha  
Publication: Prentice - Hall of India Pvt. Ltd.
7. Operations Research for Development :  
Author(s): Jonathan Rosenhead, Arabinda Tripathy  
Publication: New Age International Pvt. Ltd.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 24 (A) : Mobile Programming**

#### **Rationale:**

This course is targeted for students who want to start writing mobile applications on Android platforms. Android became a formidable mobile operating system, and this course will provide hands-on learning classes on writing Android applications. We will get started with the basics of Android programming by covering the most recent version of Android and understanding its development framework. We will learn both the fundamentals and the nuts and bolts of Android and have an exciting opportunity to write feature-rich Android applications that may be published in the Android market.

**Prerequisites:** Knowledge of the Core Java Programming, database concepts.

#### **Learning Outcomes:**

At the end of this course, student will be able:

- to understand the process of developing software for the mobile
- to create mobile applications on the Android Platform
- to create mobile applications involving data storage in SQLite database.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

##### **UNIT – I Introduction to Android [20%]**

- History of Mobile Software Development
- The Open Handset Alliance
- The Android Platform Android SDK
- Building a sample Android application
- Anatomy of Android applications
- Android terminologies

**UNIT – II Android Application Design Essentials [20%]**

- Application Context, Activities, Services, Intents
- 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

**UNIT – III Android User Interface Design Essentials [20%]**

- User Interface Screen elements
- Designing User Interfaces with Layouts
- Drawing and Working with Animation

**UNIT – IV Using Android APIs - 1 [20%]**

- Using Android Data and Storage APIs
- Managing data using SQLite
- Sharing Data between Applications with Content Providers

**UNIT – V Using Android APIs – 2 [20%]**

- Using Android Networking APIs
- Using Android Web APIs
- Using Android Telephony APIs
- Deploying (selling) your Android application

**Text Book(s):**

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, 2nd edition, Pearson Education

**Reference Books:**

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

**Unit wise coverage from Text book(s):**

- Unit 1: Chapter 1, 3, 4
- Unit 2: Chapter 5, 6
- Unit 3: Chapter 7, 8, 9
- Unit 4: Chapter 10, 11
- Unit 5: Chapter 12, 13, 16, 29

## Practical List

1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the red color with white background.  
To understand Activity, Intent
  - Create sample application with login module.(Check username and password)
  - On successful login, go to next screen. And on failing login, alert user using Toast.
  - Also pass username to next screen.
2. Create login application where you will have to validate EmailID (UserName). Till the username and password is not validated, login button should remain disabled.
3. Create and Login application as above. On successful login , open browser with any URL.
4. Create an application that will pass some number to the next screen , and on the next screen that number of items should be display in the list.
5. Understand resource folders :
  - Create spinner with strings taken from resource folder(res >> value folder).
  - On changing spinner value, change image.
6. Understand Menu option.
  - Create an application that will change color of the screen, based on selected options from the menu.
7. Create an application that will display toast(Message) on specific interval of time.
8. Create an background application that will open activity on specific time.
9. Create an application that will have spinner with list of animation names. On selecting animation name, that animation should affect on the images displayed below.
10. Understanding of UI :
  - Create an UI such that, one screen have list of all the types of cars.
  - On selecting of any car name, next screen should show Car details like : name , launched date, company name, images(using gallery) if available, show different colors in which it is available.
12. Understanding content providers and permissions:
  - Read phonebook contacts using content providers and display in list.
13. Read messages from the mobile and display it on the screen.
14. Create an application to call specific entered number by user in the EditText
15. Create an application that will create database with table of User credential.
16. Create an application that will play a media file from the memory card.
17. Create an application to make Insert, update, Delete and retrieve operation on the database.
18. Create an application to read file from the sdcard and display that file content to the screen.
19. Create an application to draw line on the screen as user drag his finger.
20. Create an application to send message between two emulators.
21. Create an application to take picture using native application.
22. Create an application to pick up any image from the native application gallery and display it on the screen.
23. Create an application to open any URL inside the application and clicking on any link from that URL should not open Native browser but that URL should open the same screen.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 25 (A) : Next Generation Application Development**

#### **Rationale:**

This course teaches how to build a simple iOS app in iOS 7 from concept to release. Its approach is based on my personal experience of creating my first iOS app. You start with an idea for an app called Bands that gets fleshed out into a set of features. You then learn about Objective-C/Swift and the design concepts that are the foundation of Cocoa Touch and the iOS SDK. From there you start to build the Bands app by progressively building the project from what is essentially a “Hello World” app to a final app that includes all features you can find in many popular iOS apps

**Prerequisites:** Knowledge of object oriented programming

#### **Learning Outcomes:**

It's for current iOS developers who would like to learn some of the technologies included in newer releases of iOS and Xcode such as storyboards, auto layout, and local search.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th	Th.	Pr.	
5	3	4	25	25	50	50	150

#### **Course Contents:**

**Unit 1 Getting Started:** Scoping the App, Defining the Features, Creating a Development Plan

**Starting a new app:** Creating a New App in Xcode, Adding a Label to a Storyboard, Running in the Simulator, Learning About Auto Layout, Exploring Application Settings, Running on a Device

**Unit 2 Creating a user input Form:** Introducing the Band Model Object, Building an Interactive User Interface, Saving and Retrieving Data

**Using table views:** Exploring Table Views, Implementing the Bands Data Source, Implementing Sections and Index, Editing Table Data

**Unit 3 Integrating the Camera and photo library in ios apps:** Adding an Image View and Gesture Recognizer, Selecting a Picture from the Photo Library, Taking a Picture with the Camera

**Integrating social media:** Sending E-mails and Text Msgs, Simplifying Social Network  
**Using web views:** Learning About Web Views Adding Navigation

**Exploring maps and local search:** Learning About Map Views, Performing a Local Search

## **Unit 4 Getting started With Web services**

- Learning About Web Services
- Exploring the iTunes Search API
- Discussing JSON
- Adding the Search View
- Introducing NSURLConnection
- Creating and Scheduling a Data Task
- Parsing JSON
- Displaying Search Results
- Previewing Tracks
- Showing Tracks in iTunes

## **Unit 5 Deploying your ios app**

- Deploying the App to Beta Testers
- Registering Beta Devices
- Generating Digital Certificates
- Creating an App ID and Ad Hoc Provisioning Profile
- Signing and Deploying an Ad Hoc Build
- Submitting the App to Apple
- Exploring iTunes Connect
- Creating an App Store Provisioning Profile
- Validating and Submitting an App

### **Text Book :**

“Beginning iOS Programming - Building and Deploying iOS Applications”, **Publisher:** Wrox,  
**By:** Nick Harris

### **Reference Books :**

- Programming iOS 7
- iOS 7 Programming Cookbook
- iOS 7 Programming Fundamental

Unit wise coverage from Text Book

- Unit 1: Chapter -1,2,3
- Unit 2: Chapter-4,5
- Unit 3: Chapter-6,7,8,9
- Unit 4: Chapter 10
- Unit 5: Chapter – 12

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 26 (A) : Mobile Cross Platform Development**

**Rationale:** PhoneGap is a growing and leading open-source mobile web apps development framework that lets developers build JavaScript and HTML5-based web applications with native wrappers for more than six mobile platforms, including iOS, Android, and BlackBerry. This framework lets you build HTML- and JavaScript-based apps and still take advantage of native mobile device capabilities like camera, localStorage, geolocation, storage and much more, irrespective of the mobile platform you target. It also lets you use more specialized JavaScript frameworks like jQuery Mobile and more.

**Prerequisite:**

Knowledge of object oriented programming, basic HTML and database concepts

**Learning Outcomes:**

- Set up app development studio with tools of the trade.
- Test the app on virtual and actual mobile devices.
- Write appropriate HTML5 for mobile
- Use CSS3 to create stunning mobile user interfaces..

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
3	3	-	25	25	50	-	100	

**Course content:**

**Unit I: Introduction to PhoneGap**

**[20%]**

A Little PhoneGap History, Why Use PhoneGap? How PhoneGap Works, Designing for the Container, Writing PhoneGap Applications, Building PhoneGap Applications, PhoneGap Limitations, PhoneGap Plug-Ins, Getting Support for PhoneGap, PhoneGap Resources, Hybrid Application Frameworks PhoneGap Development, Testing, and Debugging, Hello, World!, PhoneGap Initialization, Leveraging PhoneGap APIs, Enhancing the User Interface of a PhoneGap Application, Testing and Debugging PhoneGap Applications, Dealing with Cross-Platform Development Issues, API Consistency

**Unit II: PhoneGap Developer Tools****[20%]**

Configuring an Android Development Environment for PhoneGap, Installing the Android SDK, Eclipse Development Environment Configuration, Creating an Android PhoneGap Project, Testing Android PhoneGap Applications, Configuring a Windows Phone Development Environment for PhoneGap, Installing the Windows Phone Development Tools, Creating a Windows Phone PhoneGap Project, Testing Windows Phone PhoneGap Applications, Using PhoneGap Build, The Fit, Getting Started, Configuration, Creating an Application for PhoneGap Build, Creating a PhoneGap Build Project, Dealing with Build Issues, Testing Applications, Debug Mode

**Unit III: PhoneGap APIs –1****[20%]**

**Accelerometer:** Querying Device Orientation, Watching a Device's Orientation, **Contacts:** Creating a Contact, Searching for Contacts, Cloning Contacts, Removing Contacts. **Device:** The Network, And Notifications.

**Unit IV: PhoneGap APIs –2****[20%]**

**Events:** Creating an Event Listener, **deviceready Event,** **Application Status Events,** **Events,** **Button Events.** **File:** Available Storage Types, Accessing the Device's File System, Reading Directory Entries, Accessing FileEntry and DirectoryEntry Properties, Reading/Writing Files, Deleting/Copying/Moving Files and Directories, Uploading Files to a Server

**Unit V: PhoneGap APIs –3****[20%]**

**Media:** The Media Object, Playing Audio Files, Recording Audio Files, Seeing Media in Action

**Storage:** Local Storage, SQL Database

**Text Book:**

1. PhoneGap Essentials, Building Cross Platform Mobile Apps, John M Wargo, Addison Wesley

**Reference Books:**

1. Beginning PhoneGap, Thomas Meyer,
2. PhoneGap 2.x Mobile Application Development
3. PhoneGap Mobile Application Development Cookbook
4. 20 Recipes for Programming PhoneGap, Building Mobile Applications with Java
5. Beginning PhoneGap, Mobile Web Framework for JavaScript and HTML5, Publisher: Apress, Rohit Ghatol, Yogesh Patel

**Unit wise coverage from Text Book**

**Unit 1:** Chapters 1,2

**Unit 2:** Chapters 3,8,9

**Unit 3:** Chapters 10,15, Chapter 5 from Reference Book 1

**Unit 4:** Chapters 17,18

**Unit 5:** Chapter 20, 22

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 24 (B) : Database Administration**

#### **Rationale:**

The primary objective of this course is to provide in-depth knowledge of the administrative task of database management systems.

**Prerequisites:** Knowledge of DBMS, SQL & PL/SQL is desirable.

#### **Learning Outcomes:**

Students will learn Five components like basics of database administrations, Database user administration and security, Database backup and recovery ,Database Performance Management and data storage management, metadata management and different DBA tools at the end of this course, which are as under:

- In basics of DBA they will develop as skill to install database server, understands basic roles and responsibilities of DBA along with different current DBA trends.
- In database user administration, they will be able to create users, manage them by assigning roles and privileges. And in database security they will learn different ways to handle security through user administration, stored procedure, encryption etc.
- In database backup and recovery they will be able to take database backup and recovery using DBA tools with clarity of concepts like various backup and recovery types.
- In database performance they will be able to use and analyze DBMS stats like SQL execution plan etc. and understand the concepts like system, database and application level performance tuning.
- In last section of the course they will be able to perform data pump utility for data storage movement, metadata management and different DBA tools vendors.
- All these concepts are important to build their career as Database Administrator, Data Manager, and Architecture/Data Engineers.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th	Th.	Pr.	
5	3	4	25	25	50	50	150

## **Course Contents:**

<b>Unit 1 Basics of Database Administration</b>	<b>[20%]</b>
<b>What Is a DBA? Why DBA?</b> , Database, Data, and System Administration, <b>DBA Tasks</b> , The Types of DBAs, The Impact of Newer Technology on DBA: The Internet: From DBA to eDBA, The Personal DBA and the Cloud, NoSQL, Big Data, and the DBA, DBA Certification. <b>Creating the Database Environment</b> : Defining the Organization's DBMS Strategy, Choosing a DBMS, DBMS Architectures-ORACLE, DBMS Clustering, DBMS Proliferation, Hardware Issues, and Cloud Database Systems. <b>Installing the DBMS-ORACLE</b> : DBMS Installation Basics, Hardware Requirements, Storage Requirements, Memory Requirements, Configuring the DBMS, Connecting the DBMS to Supporting Infrastructure Software, Installation Verification, DBMS Environments, Database Standards and Procedures.	
<b>Unit 2 Database User Administration and Security</b>	<b>[20%]</b>
Database Security Basics : Database Users ,Granting and Revoking Authority :Types of Privileges ,Granting to PUBLIC ,Revoking Privileges ,Label-Based Access Control, Security Reporting ,Authorization Roles and Groups, Other Database Security Mechanisms, Using Views for Security ,Using Stored Procedures for Security, Encryption ,Data at Rest Encryption: Data in Transit Encryption, Encryption Techniques ,SQL Injection: Prevention ,Auditing , External Security, Job Scheduling and Security , Database Authentication Methods( Database Authentication, Database Administrator Authentication, Operating System Authentication, Network Authentication, 3-tier Authentication, Client-Side Authentication, Oracle Identity Management, User Accounts), Database Authorization Methods (Profile Management, System Privileges, Object Privileges, Creating, Assigning, and Maintaining Roles), Non-DBMS DBA Security.	
<b>Unit 3 Database Backup &amp; Recovery</b>	<b>[20%]</b>
The Importance of Backup and Recovery: Preparing for Problems ,Backup :Full versus Incremental Backups, Database Objects and Backups, DBMS Control, Concurrent Access Issues ,Backup Consistency , Log Archiving and Backup ,Determining Your Backup Schedule, DBMS Instance Backup ,Designing the DBMS Environment for Recovery, Alternate Approaches to Database Backup, Document Your Backup Strategy ,Database Object Definition Backups ,Recovery :Determining Recovery Options ,General Steps for Database Object Recovery, Types of Recovery ,Index Recovery ,Testing Your Recovery Plan ,Recovering a Dropped Database Object, Recovering Broken Blocks and Pages, Populating Test Databases, Alternatives to Backup and Recovery: Standby Databases, Replication , Disk Mirroring.	
<b>Unit 4 Database Performance Management</b>	<b>[20%]</b>
<b>Defining Performance</b> : A Basic Database Performance Road Map-Monitoring versus Management, Reactive versus Proactive, Types of Performance Tuning - System Tuning, Database Tuning, Application Tuning, Performance Tuning Tools. Memory Usage, Data Cache Details, "Open" Database Objects, Database Logs ,Locking and Contention, The System Catalog, Other Configuration Options, System Monitoring.	
<b>Database Performance</b> : Techniques for Optimizing Databases, Partitioning ,Raw Partition versus File System, Indexing, Denormalization, Clustering, Interleaving Data, Free Space, Compression, File Placement and Allocation, Page Size (Block Size) ,Database Reorganization, Determining When to Reorganize, Automation.	

**Application Performance:** Designing Applications for Relational Access -Relational Optimization, CPU and I/O Costs ,Database Statistics-Query Analysis, Joins ,Access Path Choices Additional Optimization Considerations ,View Access ,Query Rewrite, Rule-Based Optimization, Reviewing Access Paths, Forcing Access Paths, SQL Coding and Tuning for Efficiency, A Dozen SQL Rules of Thumb, Additional SQL Tuning Tips, Identifying Poorly Performing SQL.

## **Unit 5 Data Storage Management, Metadata Management & DBA Tools [20%]**

**Storage Management Basics:** Files and Data Sets, File Placement on Disk ,Raw Partitions versus File Systems, Temporary Database Files ,Space Management ,Data Page Layouts ,Index Page Layouts, Transaction Logs, Fragmentation and Storage ,Storage Options, Storage Area Networks, Data Movement and Distribution using Export and Import data pump utility.

**Metadata Management:** What Is Metadata?, From Data to Knowledge and Beyond ,Metadata Strategy, Data Warehousing and Metadata ,Types of Metadata ,Repositories and Data Dictionaries ,Repository Benefits, Repository Challenges, Data Dictionaries

**DBA Tools:** Types and Benefits of DBA Tools, Native DBA Tools, Evaluating DBA Tool Vendors.

### **Text Books:**

1. Database Administration The Complete Guide to DBA Practices and Procedures, Second Edition Craig S. Mullins, Addison Wesley.
2. Kevin Loney, Bob Bryla, "Oracle 10g/11g, DBA Handbook", Oracle Press, TMGH Publications Ramesh Elmasari, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 5th Edition

### **Reference Books:**

1. Oracle 10g/11g/onwards Administration in Simple Steps by Dreamtech
2. Oracle Administration & Management by Wiley
3. Oracle Applications DBA Field Guide by Apress
4. MySQL Cookbook by O'reilly
5. MySQL Database Design & Tuning by MySQL Press
6. MySQL in a Nutshell by O'reilly
7. SQL Server 2000 Administration Study Guide by Rick Sawtell, Lance Mortensen, Joseph L. Jorden

### **Unit wise coverage from text book(s):**

- UNIT 1: Book 1 Chp. 1, 2
- UNIT 2: Book 1 Chp. 14
- UNIT 3: Book 1 Chp. 16
- UNIT 4: Book 1 Chp. . 9,10,11,12
- UNIT 5: Book 1 Chp. 18,19(pg 662), 22(pg 685-695),23(pg 699,728,729)

### **Practical List**

1. Installation of Software
2. Create database using Oracle Configuration Assistant
3. Predefined Administrative Accounts Predefined  
Non-Administrative User Accounts Predefined  
Sample Schema User Accounts
  - a. Create User, Roles, Grant different objects and system privileges to users. Grant different roles to users.

4. Managing Table space
  - a. Creating a Table space
  - b. Modifying a Table space
  - c. Dropping a Table space
  - d. Reclaiming Unused Space
5. Add, Move, and Resize, Datafiles in different table spaces.
6. Managing Rollback Segments
7. Work on different backup & recovery options
8. Work on different Import/Export options.
9. Work of at least 5 tuning options.
  - a. Use of auto trace
  - b. Explain plan
  - c. SQL Tuning Advisory
  - d. Use Of Indexing
10. Workshop of DBA based on latest trends.

**Note:**

1. PROJECT Work OR CASE Study can be given based on other databases like MYSQL, MS-SQL (SQL SERVER), POSTGRES etc. to explore various domains of database systems.
2. For Practical Book#2

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 25 (B) : Big Data and Data Analytics**

#### **Rationale:**

The course provides a deep dive into Big Data Analytics, by giving the fundamental knowledge of the concepts of big data and provides an advanced practical based learning that allows students to lead and develop in Big Data Analytical projects

**Prerequisites:** Knowledge of Database Management Systems, Object Oriented Programming & Basic statistics

#### **Learning Outcomes:**

- This course will teach how to program in R and use R for effective data analysis.
- The students will learn how to install and configure R necessary for an analytics programming environment and gain basic analytic skills via this high-level analytical language.
- The course covers fundamental knowledge in R programming.
- Students can able to visualize the output in different graphical format
- Popular R packages for data science will be introduced as working examples.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

SUB Total CREDIT	<u>Teaching scheme</u>		<u>Examination scheme</u>				Total Marks	
	(per week)		MID	CEC	External			
	Th.	Pr.	Th.	Th.	Pr.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

##### **Unit 1: The Fundamentals of Big Data** [20%]

**Application:** To understand big data concepts, big data adoption, planning and business intelligence

**Understanding Big Data:** Concepts and Terminology, Big data characteristics, Different Types of Data

**Business Motivations and Drivers for Big Data Adoption:** Marketplace Dynamics, Business Architecture, Business Process Management, Information and Communication Technology, Internet of Everything (IoE)

**Big Data Adoption and Planning Considerations:** Organization Prerequisites, Data Procurement, Privacy, Security, Provenance, Limited Realtime Support, Distinct Performance Challenges, Distinct Governance Requirements, Distinct Methodology, Clouds, Big Data Analytics Lifecycle

**Enterprise Technologies and Big Data Business Intelligence:** OLTP, OLAP, ETL, Data Warehouse, Data Marts, Traditional BI, Big Data BI

**Page No: Book – 1: 3 to 20, 29 to 42, 47 to 69, 77 to 87**

**Unit 2: Introduction and Features of R Language [20%]**

**Application:** To start installing and learn to work with R and RStudio

**What is R?** Installing R, Choosing an IDE, Your First Program, How to Get Help in R, Installing Extra Related Software

**Scientific Calculator:** Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors

**Inspecting Variables:** Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables, Workspace

**Vectors, Matrices and Arrays:** Vectors, Matrices and Arrays

**Lists and Data Frames:** Lists, NULL, Pairlists, Data Frames

**Page No: Book – 2: 2 to 77**

**Unit 3: Control Flow, Looping, Package, Data Time [20%]**

**Application:** To implement the control flow and looping structure involved in R, to understand and implement different packages and work with date and time

**Environments and Functions:** Environments, Functions

**Strings and Factors:** Strings, Factors

**Flow Control and Loop:** Flow controls, Loops, **Advanced Looping:** Replication, Looping over Lists, Looping Over Arrays, Multiple-Input Apply, Split-Apply-Combine, The plyr Package

**Packages:** Loading Packages, Installing Packages, Maintaining Packages

**Page No: Book – 2: 79 to 150**

**Unit 4: Working with Date & Time and Data Analysis Workflow [20%]**

**Application:** Working with date time, different set of data and applying cleaning and transformation of data

**Dates and Times:** Date and Time Classes, Conversion to and from Strings, Time Zones, Arithmetic with Dates and Times, Lubridate

**Getting Data:** Built-in Datasets, Reading Text Files, Reading Binary Files, Web Data, Accessing Databases

**Cleaning and Transforming:** Cleaning Strings, Manipulating Data Frames, Sorting, Functional Programming

**Page No: Book – 2: 153 to 202**

## **Unit 5: Graphics, Model Creation and Comparison**

**[20%]**

**Application:** To explore and visualize the derived output in different graph format and understanding the graphs, implementation of different distribution and modeling using programming structure

**Exploring and Visualizing:** Summary Statistics, the Three Plotting Systems, Scatterplots, Line Plots, Histograms, Box Plots, Bar Charts, Other Plotting Packages and Systems

**Distributions and Modeling:** Random Numbers, Distributions, Formulae, First Model: Linear Regressions, Other Model Types

**Programming:** Messages, Warnings and Errors, Error Handling, Debugging, Testing

**Page No: Book – 2: 207 to 298**

### **Text Book**

1. Big Data Fundamentals Concepts, Drivers & Techniques, Thomas Erl, Wajid Khattak, and Paul Buhler, Prentice Hall, Pearson publication
2. Learning R, Richard Cotton, O'Reilly Publications

### **Reference Books:**

- A Learning Guide to R Beginner to intermediate skills in data analysis, visualization, and manipulation, Remko Duursma, Jeff Powell & Glenn Stone
- R Programming for Data Science, Roger D. Peng, Lean Publishing
- R for Beginners, Emmanuel Paradis
- [http://cran.r-project.org/doc/contrib/Paradis-rdebuts\\_en.pdf](http://cran.r-project.org/doc/contrib/Paradis-rdebuts_en.pdf)
- The Art of R Programming, Norman Matloff
- Big Data Analytics with R and Hadoop, Vignesh Prajapati, PACKT Publication

### **Practical Questions:**

1. Create two excel file which store the details of the employees personal details, official details, based on the joining details of the employee and the increment given predict list of employee whether promotion can be given or not.
2. Create an excel file to store the details of the patients health details,
  - a. Predict whether the user is healthy or not based on the health reports.
  - b. Prediction should be done based on the normal values [i.e: BMI, weight, BP, Cholesterol etc]
3. Read two matrixes and perform all the matrix operations like addition, subtraction, multiplication, division, transpose. Assign name for the rows and columns
4. Create multiple vector, read all the vectors, store in a data frame and perform all the operations and conditions based on the vector.
  - a. Assign new name to the data frame
  - b. Attach the new column
  - c. Print the output in the new column based on some conditions
5. Create an excel file which contains the sale details of 3 years in a particular industry.
  - a. Represent the details in the form of histogram, barplot, boxplot

6. Create an excel file which stores the result details of the students of MCA. Predict the next year result based on the criteria like [Theory assignment, Practical assignment, Class performance, attendance, etc ]. Plot the scatter plot of the performance of the students.
7. Write the R code which store the player information like Name, Team, No of times has played, No of goals scored till date.
  - a. Store the details in the .csv file
  - b. Display the details of a single player by entering the name
  - c. Display the full details of a player who has secured maximum score.
  - d. Display the average score of each team.
  - e. Update the score of a particular team and store the details in .csv through R
8. Perform the list of operations for the following:
  - a. List the objects in memory.
  - b. Clear the screen.
  - c. Declare variables x, y and assign values of 5 and 8 to x and y.
  - d. Perform simple calculations like addition, subtraction, division, multiplication etc. on x and y.
  - e. Print the values of variables on screen.
  - f. Assign five distinct values to z.
  - g. Assign sequential value from 1 to 20
  - h. Declare an array a.
  - i. Input multiple values from the user at prompt and store it in c.
  - j. Show the data types of all objects on screen.
  - k. Sort the values in descending order.
  - l. Find out the sum, max, min, diagonal element of matrix.
  - m. Find out the working directory and change it.
  - n. Remove x and y objects from memory.
  - o. Print only odd numbers of series.
9. Create a matrix of 3 x 3 and make layout, and print the data in the layout.
10. Generate a graphical image by using all plot, define the title, x-axis, y-axis, x limit and y-limit of a graph for a .csv file?
11. Retrieve the data from the .csv file
  - a. Normalize the data
  - b. Represent in a graphical form
  - c. Specify x-axis, y-axis, x-limit, y-limit, include color to the graph, change the plot style
12. Use the lattice library and display the graphical image of all lattice form
13. Generate the .csv file, create different models and specify the,
  - a. Summary of different models
  - b. Find the residual, co-efficient, fitted and AIC.
14. Write a R function to calculate the Fibonacci series.
15. Write the R code to predict whether loan to be sanctioned or not to be sanctioned for a particular customer.
  - a. Prepare the dataset of list of customers with their personal data, salary details, previous loan taken, EMI details per month, bank account details.
  - b. Based on the input criteria predict whether loan to be given or not.
  - c. If sanctioned mention the loan amount that got sanctioned
  - d. Prepare a separate file and store the output details
  - e. Display the current years currents loan status in a graph

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 26 (B) : Next Generation Databases**

**Rationale:** The primary objective of this course is to provide in-depth knowledge of the next generation databases and future database technologies from SQL to NoSQL to NewSQL, different databases like document, graph, columnar databases etc.

**Prerequisite:** Knowledge of DBMS, ADBM, SQL & PL/SQL is desirable.

#### **Learning Outcomes:**

Students will learn seven concepts like database revolution, Document Databases, Graph Databases, Column Databases, In-Memory Databases, Object Databases, and Databases of Future. At the end of this course, they will enhance their conceptual and analytical understanding as under:

- In database revolution they will understand the first, second and third revolution of databases from file base databases to SQL to NoSQL to NewSQL.
- In document databases, they will be able to understand the document database overview, NoSQL databases, overview of MongoDB and CouchDB.
- In Graph and Column databases, they will be able to understand the graph and column databases overview and overview of Neo4j , Gremlin, Sybase IQ, C-Store, and Vertica.
- In Memory and Object databases, they will be able to understand features of in-memory databases and object databases overview and overview of TimesTen , Redis , SAP HANA, VoltDB , Oracle 12c, SPARK architectures.
- In last section of the course they will be able to make them understands about future database technologies like storage, block chain and quantum computing.
- All these concepts are important to build their career as Data Architecture/Data Engineers, Data Scientist, Data Analyst and DBAs.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th	Th.	Pr.	
3	3	-	25	25	50	-	100

**Course content:****Unit 1 Database Revolution****[20%]**

Three Database Revolutions, Early Database Systems-The First Database Revolution, The Second Database Revolution- Relational theory, Transaction Models, The First Relational Databases, Client-server Computing, Object-oriented Programming and the OODBMS, The Relational Plateau, The Third Database Revolution, Google and Hadoop, The Rest of the Web, Cloud Computing, Document Database, The “NewSQL”, The Nonrelational Explosion. Google, Big Data, and Hadoop, The Big Data Revolution- Cloud, Mobile, Social, and Big Data, Google: Pioneer of Big Data, Google Hardware, The Google Software Stack , More about MapReduce, Hadoop: Open-Source Google Stack -Hadoop’s Origins, The Power of Hadoop, Hadoop’s Architecture, HBase ,Hive, Pig , The Hadoop Ecosystem.

**Unit 2 Document Databases****[20%]** What

is a document database, NoSQL databases, Why choose NoSQL?, Performance overview of different databases, Why a document store, How does it work, Data storage ,Data querying and the map/reduce paradigm ,Inserting and Modifying, ACID , The different solutions -Open source solution ,Proprietary solution. Examples - CouchDB, Why CouchDB , The storage, concurrency, Managing the database, Querying the database, Specificity of Couch DB.

Examples - MongoDB, Why MongoDB?, The storage, concurrency, Managing the database, Querying the database, Specificity of Mongo DB.

**Unit 3 Graph Databases & Column Databases****[20%]**

What is a Graph? , RDBMS Patterns for Graphs, RDF and SPARQL, Property Graphs and Neo4j , Gremlin, Graph Database Internals, Graph Compute Engines. What is Column Databases, Why it used? The Columnar Alternative - Columnar Compression, Columnar Write Penalty, Sybase IQ, C-Store, and Vertica, Column Database Architectures -Projections, Columnar Technology in Other Databases.

**Unit 4 In-Memory Databases & Object Databases****[20%]**

What is In-Memory Databases?, The End of Disk? -Solid State Disk , The Economics of Disk ,SSD-Enabled Databases, In-Memory Databases-Examples : TimesTen , Redis , SAP HANA ,VoltDB , Oracle 12c “in-Memory Database”, Berkeley Analytics Data Stack and Spark , Spark Architecture. Overview of object databases, Object Oriented Database, Object Relational Database, mapping of object relational mapping and standards of ODBMS, Examples -ObjectDB, ObjectStore, ObjectivityDB, db4o and GemStone features and advantages.

**Unit 5 Databases of Future****[20%]**

The revolution revisited, counterrevolutionaries-have we come full circle?, can we have it all?- consistency models, schema, database languages, storage, a vision for a converged database, other convergent databases, Disruptive database technologies-storage technologies, Blockchain-What it is?, Understanding Technologies, When it is used?, Quantum computing-Quantum Transaction, Quantum Search, Quantum Query Language.

**Text Books:**

1. Next Generation Databases – NoSQL, NewSQL and Bigdata, Guy Harrison, Apress.
2. CouchDB, Document oriented Databases,Alain Issa, François Schiltz,ULB
3. Document stores and MongoDB, Kaïs Albichari , Tanguy d’Hose, ULB
4. MongoDB Architecture Guide, MongoDB university, white paper
5. Graph Databases-neo4j, Ian Robinson,Jim Webber & Emil Eifrem, 2<sup>nd</sup> edition ,Oreilly

6. The Design and Implementation of Modern Column-Oriented Database Systems, Daniel Abadi, Foundations and Trends in Databases Vol. 5, No. 3 (2012) 197–280, 2013
7. <http://justinlevandoski.org/papers/fnt-mmdb.pdf>
8. Oracle® Database, Database In-Memory Guide, 12c Release, Lance Ashdown, Oracle Press
9. Fundamentals of Object Databases: Object-Oriented and Object-Relational Design, Suzanne W. Dietrich and Susan D. Urban, Morgan & Claypool publishers
10. Blockchain basics, Technical Introduction in 25 Steps, Daniel Drescher, Apress

### **Web References:**

1. [couchdb.apache.org](http://couchdb.apache.org)
2. CouchDB: The Definitive Guide: [guide.couchdb.org/](http://guide.couchdb.org/)
3. Amazon DynamoDB vs. CouchDB vs. MongoDB Comparison
4. <https://db-engines.com/en/system/Amazon+DynamoDB%3BCouchDB%3BMongoDB>
5. <https://university.mongodb.com/>
6. <https://pdfs.semanticscholar.org/f511/7084ca43e888fb3e17ab0f0e684cced0f8fd.pdf>
7. <http://asiandatascience.com/wp-content/uploads/2017/12/Definitive-Guide-Graph-Databases-for-RDBMS-Developer.pdf>
8. <http://www.durusau.net/localcopy/Graph-Modeling-Do.s-and-Don.ts.pdf>
9. [https://www.jugdo.de/wp-content/uploads/2014/01/intro\\_to\\_neo4j\\_jugdo.pdf](https://www.jugdo.de/wp-content/uploads/2014/01/intro_to_neo4j_jugdo.pdf)
10. [http://nms.csail.mit.edu/~stavros/pubs/tutorial2009-column\\_stores.pdf](http://nms.csail.mit.edu/~stavros/pubs/tutorial2009-column_stores.pdf)

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 24 (C) : Wireless Sensor Networks**

**Rationale:** The objective of this course is based on understanding Overview, Technology, Protocol and Application of wireless sensor networks (WSN). It covers theoretical as well as applied aspects of wireless sensor networks platform and analyzes a number of working systems (case studies).

**Prerequisite:**

Knowledge of Knowledge of Wireless Networks, Protocols, Transmission Media, Computer Network Operating Systems

**Learning Outcomes:**

Students will learn 5 aspects of WSN in this course, which are as under:

1. They will learn about basic concepts of WSN
2. They will learn concepts of protocols used in WSN.
3. They will learn various strategies used in WSN.
4. They will learn how to implement the TCP protocol in with respect to WSN
5. They will learn different middleware used in WNS, WNS management challenges and models and Operating System environment used.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

**Course content:**

**UNIT-I: Overview of Wireless Sensor Networks & Technology**

[10%]

- Basics of wireless sensors network's
- Commercial and Scientific Applications of Wireless Sensor Networks
- Wireless sensors network technology
  - a. Sensor Node Technology
  - b. WN Operating Environment

**UNIT-II: Wireless Sensors Network Protocols**

[20%]

- MAC Protocols for WSNs
  - Schedule-Based Protocols
  - Random Access-Based Protocols
- IEEE 802.15.4 LR-WPANs Standard Case Study - PHY Layer & MAC Layer
- Routing Challenges and Design Issues

- Network Scale and Time-Varying Characteristics
- Resource Constraints
- Sensor Applications Data Models

**UNIT-III: Routing Strategies** [25%]

- WSN Routing Techniques
- Flooding and Its Variants
- Sensor Protocols for Information via Negotiation
- Low-Energy Adaptive Clustering Hierarchy
- Power-Efficient Gathering in Sensor Information Systems
- Directed Diffusion
- Geographical Routing

**UNIT-IV: Transport Control Protocols** [25%]

- CODA (Congestion Detection and Avoidance)
- ESRT (Event-to-Sink Reliable Transport)
- RMST (Reliable Multi-segment Transport)
- PSFQ (Pump Slowly, Fetch Quickly)
- GARUDA
- ATP (Ad Hoc Transport Protocol)
- Problems with Transport Control Protocols

**UNIT-V: WSN- Middleware, Management and Operating System** [20%]

- Middleware - MiLAN (Middleware Linking Applications and Networks) & Impala
- Management
  - a. Network Management Requirements
  - b. Network Management Models
  - c. Network Management Design Issues
- Operating Systems – TinyOS & Mate

**Text Book:**

Wireless Sensor Networks Technology, , Protocols and Application by KAZEM SOHRABY, DANIEL MINOLI, TAIEB ZNATI, Wiley

**Unit wise coverage from text book(s):**

UNIT 1 :	BOOK 1	CH 1 ,2,3 (FULL)
UNIT II	BOOK 1	CH 5 (5.4,5.6) CH 6(6.4)
UNIT III	BOOK 1	CH 6 (6.5)
UNIT IV	BOOK 1	CH 7 (7.3,7.4)
UNIT V	BOOK 1	CH 8 (8.4.1, 8.4.8) CH 9 (9.2, 9.3, 9.4) CH 10(10.3.1,10.3.2)

**Practical Programs:** To be done in NS-2 or NS-3 simulator. TCL scripts to be used for simulation.

### **WIRED SCENARIO**

1. Write a script in NS to simulate the following scenario –  
A network consists of 3 nodes (Node 0, 1 and 2). The duplex link between node 0 and node 1 has 1 Mbps of bandwidth and 10 ms of delay. The duplex link between node 1 and node 2 has 2Mbps of bandwidth and 10 ms of delay. Each link uses a Drop Tail queue. A "TCP" agent is attached to node 0. "TCPSink" agent is attached to node 2. Both the agents are connected. As default, the maximum size of a packet that a "TCP" agent can generate is 1000bytes. A "TCPSink" agent generates and sends ACK packets to the sender (tcp agent) and frees the received packets. The ftp is set to start at 0.2 sec and stop at 3.0 sec.
2. Write a script in NS to simulate the following scenario –  
A network consists of 5 nodes (Client1, Client2, Router1, Router2 and Endserver1). The duplex links between Client1 Client2 and Router1 have 2 Mbps of bandwidth and 100 ms of delay. The duplex link between Router1 and Router2 has 2Mbps of bandwidth and 100 ms of delay. The duplex link between Router2 and Endserver1 has 200Kbps of bandwidth and 100 ms of delay. Each link uses a Drop Tail queue. A "TCP" agent is attached to Client1, and Client2. "TCPSink" agent is attached to Endserver1. Both the agents are connected. As default, the maximum size of a packet that a "TCP" agent can generate is 1000bytes. A "TCPSink" agent generates and sends ACK packets to the sender (tcp agent) and frees the received packets. The ftp is set to start at 0.5 sec and stop at 5.5 sec.
3. Write a script in NS to simulate the following scenario –  
A network consists of 6 nodes (Client1, Client2, Router1, Router2, Router3 and Server1). The duplex links between Client1 Client2 and Router1 have 3 Mbps of bandwidth and 200 ms of delay. The duplex link between Router1 and Router2 has 2Mbps of bandwidth and 100 ms of delay. The duplex link between Router2 and Server1 has 100Kbps of bandwidth and 300 ms of delay. Each link uses a Drop Tail queue. A "TCP" agent is attached to Client1, and Client2. "TCPSink" agent is attached to Server1. Both the agents are connected. As default, the maximum size of a packet that a "TCP" agent can generate is 2000bytes. A "TCPSink" agent generates and sends ACK packets to the sender (tcp agent) and frees the received packets. The ftp is set to start at 0.3 sec and stop at 4.0 sec.
4. Write a script in NS to simulate the following scenario –  
A network consists of 15 nodes. Create mesh topography. The duplex links between nodes have 10 Mbps of bandwidth and 100 ms of delay. Each link uses a Drop Tail queue. A "TCP" agent is attached to node 0. "TCPSink" agent is attached to Node 14. Both the agents are connected. As default, the maximum size of a packet that a "TCP" agent can generate is 1500bytes. Use CBR application type. The CBR is set to start at 0.2 sec and stop at 8.0 sec.

### **WIRELESS SCENARIO**

5. Write a script in NS to simulate the following wireless scenario –  
A network consists of 4 mobile (wireless) nodes. A TCP connection is setup between the mobile nodes. Packets are exchanged between the nodes. Apply all the wireless scenario parameters.

6. Write a script in NS to simulate the following wireless scenario –

A network consists of two mobile (wireless) nodes, node 0 and node 1. The mobile nodes move about within an area whose boundary is defined as 500m X 500m. The nodes start out initially at two opposite ends of the boundary. Then they move towards each other in the first half of the simulation and again move away for the second half. A TCP connection is setup between the two mobile nodes. Packets are exchanged between the nodes as they come within hearing range of one another. As they move away, packets start getting dropped.

7. Write a script in NS to simulate the following wireless scenario –

A network consists of 10 mobile (wireless) nodes. The mobile nodes move about within an area whose boundary is defined as 400m X 400m. 3 nodes move from left to right and 2 nodes move from right to left. Protocol used is AODV. Maximum packet size is 100 bytes. A TCP connection is setup between mobile nodes. Packets are exchanged between the nodes. FTP starts at 0.8 sec and stops at 4.0 sec. Color of node changes to blue at 1.5sec.

8. Write a script in NS to simulate the following wireless scenario –

A network consists of 20 mobile (wireless) nodes. The mobile nodes move about within an area whose boundary is defined as 600m X 500m. 5 nodes move from bottom to up. Protocol used is DSDV. Maximum packet size is 50 bytes. A TCP connection is setup between mobile nodes. Packets are exchanged between the nodes. FTP starts at 0.6 sec and stops at 5.0 sec. Color of node changes to yellow at 1.5sec.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 25 (C) : Information & Network Security**

#### **Rationale:**

- To give the understanding of the different type of security mechanism performed in Internet.
- To describe mechanism of firewall and Intruders
- To give the understanding of the functionality symmetric and asymmetric Encryption Method.
- To describe the working of routing algorithms and its techniques.

**Prerequisites:** Knowledge of Networks, OSI and TCP/IP Model

#### **Learning Outcomes:**

At the end of the course, student will be able to:

- Describe and analyze the software, components of a network and the interrelations.
- Explain networking protocols and their hierarchical relationship.
- Compare protocol models and select appropriate protocols for a particular design.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
5	3	4	25	25	50	50	150	

#### **Course Contents:**

<b>UNIT – I</b>	<b>Network Security and Symmetric Encryption</b>	<b>[20%]</b>
	Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A Model for Internetwork Security, Internet Standards the Internet Society, Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation	
<b>UNIT – II</b>	<b>Asymmetric key Encryption Techniques</b>	<b>[20%]</b>
	Location of Encryption Devices, Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures	
<b>UNIT – III</b>	<b>Authetication Mechanism and Virus Protection</b>	<b>[20%]</b>
	Key Management, Kerberos, X.509 Directory Authentication Service, Public Key Infrastructure, Malicious Software: Types of Malicious Software, Viruses, Virus Countermeasures, Worms, Distributed Denial of Service Attacks	
<b>UNIT – IV</b>	<b>Web Security and Intrusion</b>	<b>[20%]</b>
	Web Security Considerations, Secure Sockets Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Intrusion Detection.	
<b>UNIT – V</b>	<b>Passwords and Firewalls</b>	<b>[20%]</b>
	Password Management, Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.	

**Text Book(s):**

1. William Stallings, "Network Security Essentials: Applications and Standards", 3rd Edition, Pearson Education
2. "Computer Networks" by Andrew Tanenbaum, Pearson Education

**Other Reference Books:**

1. Behrouz Forouzan, "Cryptography and Network Security", TMH Publication.
2. Nina Godbole, "Information Systems Security", Wiley Publication.
3. William Stallings, "Cryptography and Network Security", Pearson Education

**Unit wise coverage from above Text books:**

Unit No.	Chapter	Description
Unit - I	Chapter – 1	All
	Chapter – 2	All
Unit – II	Chapter – 3	All
Unit – III	Chapter – 4	All
	Chapter – 10	All
Unit – IV	Chapter – 5	All
Unit – V	Chapter – 9	All
	Chapter – 11	All

**Practical Programs**

Note: - Develop a JAVA program to simulate a Client – Server scenario fulfilling the following conditions

**Practical List**

1. Sender/Recv Program that converts decimal data into binary and vice versa.
2. Sender/Recv Program appends the total count of characters in the string.
3. Sender/Recv Program that performs byte stuffing in the data.
4. Sender/Recv Program that performs character stuffing in the data.
5. Sender/Recv Program to implement VRC method.
6. Sender/Recv Program to implement LRC method.
7. Sender/Recv Program to implement Checksum method.
8. Sender/Recv Program to implement CRC method.
9. Sender/Recv Program to implement Mono Alphabetic Substitution Method
10. Sender/Recv Program to implement Caesar Method
11. Sender/Recv Program to implement Transposition Method
12. Sender/Recv Program to implement One time Pad Method
13. Sender/Recv Program to implement RSA Method
14. Program to implement P-box
15. Program to implement S-box
16. Write a program of DES with Cipher Block Chaining mode.
17. Write a program of DES with Cipher Feedback mode
18. Write a program of DES with Electronic Codebook mode
19. Write a program of DES with Output Feedback mode.
20. X.509 Certificate creation

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester II**

### **MCA - 26 (C) : Heterogeneous Networks**

**Rationale:** The objective of this course is based on understanding Overview, Technology, Management and Application of Heterogeneous networks. It covers theoretical as well as applied aspects of Heterogeneous Network and analyzes a number of working systems (case studies).

**Prerequisite:**

Knowledge of Knowledge of Wireless Networks, Protocols, Transmission Media, Computer Network Operating Systems

**Learning Outcomes:**

Students will learn following aspects:

1. They will learn about basic concepts of HetNets
2. They will learn concepts of protocols used in HetNets.
3. They will learn various Mobile Technologies and their protocols

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
3	3	-	25	25	50	-	100	

**Course content:**

**UNIT- I: Introduction and overview of Heterogeneous Networks**

[25%]

- Motivations for Heterogeneous Networks
- Definitions of Heterogeneous Networks
- Heterogeneous Networks Use Scenarios
- Aspects of Heterogeneous Network Technology
  - RF Interference
  - Radio System Configuration
  - Network Coupling
  - User and Device Credential
  - Interworking
  - Handover
  - Data Routing
  - Quality of Service
  - Security and Privacy
  - Capacity and Performance Evaluation
- Heterogeneous cellular network nodes
  - Remote radio heads
  - Micro base stations

- Pico base stations
- Femto cell access points
- Relay nodes
- Introduction to 3GPP LTE advanced heterogeneous cellular networks.

## **UNIT-II: Multi-tier Network Architecture**

[25%]

- Heterogeneous Network Deployment Scenarios.
  - OSG scenario
  - CSG scenario
- Interference Management
- Multi-radio techniques
- Cross-tier interference
- Deployment Scenarios for LTE-Advanced HetNet
  - Macro-Femto Scenario
  - Macro-Pico Scenario.

## **Unit-3 Inter-cell interference Management**

[10%]

- Introduction
- Conventional inter-cell interference Coordination
- Enhanced inter-cell Interference Coordination
  - Interference Scenarios

## **Unit-4 Mobility and handover management**

[20%]

- Mobility Management in RRC-connected state.
- Mobility Management in RRC-idle state
  - Mobility Management in heterogeneous cellular networks.

## **Unit-5 Cell Selection Modes in Heterogeneous Deployment**

[20%]

- Distinction of cells
- Access Control
  - Access Control Scenarios
  - Access Control Executor
  - Access Control Mechanism
- Cell Selection and Cell Reselection.
- Cell Reselection in Macro-Femto cells.

### **Text Book:**

1. Heterogeneous Cellular Networks. – Rose Qing Hu, Yi Qian – Wiley Publication, IEE Press

### **Reference Books:**

1. Heterogeneous Cellular Networks – Theory, Simulation and Deployment, By: Xiaoli Chu, David Lopez- Perez, Yang Yang, Fedrik Gunnarsson - Cambridge University Press.
2. Heterogeneous Wireless Access Networks – Ekram Hossain – Springer.

# **SEMESTER – III**

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 31 : Artificial Intelligence**

#### **Rationale:**

The objective of this course to teach the concept of J2EE so they can easily development the application using Servlet, JSP , JDBC and other concept. Instruction shall be in a laboratory setting with continuous hands-on implementation of concepts and emphasis on developing application in AJP.

**Prerequisite:** Basic knowledge of Object Oriented Programming Language (Core Java)

#### **Learning Outcomes:**

On completion of this subject the student is expected to:

1. Identify problems that can be solved by search, and create search-based solution algorithms
2. Design intelligent agents
3. Choose the best search-based solving methods for a particular problem
4. Make use of formal approaches for representing and reasoning about knowledge
5. Build systems that use simple learning approaches to improve their performance

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th.	Pr.		
4	3	2	25	25	50	50	150

#### **Course Contents:**

##### **UNIT 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE [20%]**

Artificial Intelligence: What is AI? Foundations of AI, Applications;

Problem Solving: Production Systems, State Space Search, Heuristic Search Techniques – Branch & Bound Search, Hill Climbing, Breadth First Search, A\* Algorithm

##### **UNIT 2: KNOWLEDGE REPRESENTATION & LOGIC CONCEPTS [25%]**

Knowledge Representation Schemes: Semantic Networks, Frames, Scripts, Proposition and Predicate Logic, Rule Based Systems

Logic Concepts: Logical Study of Valid and Sound Arguments, Non-Logical Operators, Syntax of Propositional Logic, Semantics/Meaning in Propositional Logic, Interpretations of Formulas, Validity and Inconsistency of Propositions, Equivalent forms in the Propositional Logic (PL), Normal Forms,

Syntax of First order Predicate Logic, Prenex Normal Form (PNF), (Skolem) Standard Form, Applications of FOPL

### **UNIT 3: NATURAL LANGUAGE PROCESSING**

[20 %]

Natural Language Processing: Sentence Analysis – Morphological, Syntactical, Semantic, Pragmatic and Discourse Analysis; Decision Trees, State Machines, Grammars & Parsers, Top down Parsing, Bottom up Parsing

### **UNIT 4: EXPERT SYSTEMS & INTELLIGENT AGENTS**

[20 %]

Expert Systems: Expert System Architecture, Expert System Shells, Examples of Expert Systems

Intelligent Agents: Classification of Agents, Working of an Agent, Task Environment of Agents (PEAS), Structure of Agents

### **UNIT 5: FUZZY SYSTEMS**

[15%]

Fuzzy Systems: Fuzzy Systems, Relations on Fuzzy Sets, Operations on Fuzzy Sets, Operations Unique to Fuzzy Sets

#### **Text Books:**

1. Artificial Intelligence by Saroj Kaushik, Cengage Learning
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, PHI
3. Artificial Intelligence for Games by Ian Millington, Morgan Kaufmann Publishers

#### **Chapter & Topics –**

<b>Unit</b>	<b>Book</b>	<b>Chapter</b>	<b>Topic</b>
1	1	1 & 2	1.1 to 1.9 2.1, 2.2, 2.3, 2.5.1, 2.5.2, 2.5.3, 2.5.5, 2.5.6
2	1	4, 7 & 15	4.1, 4.2, 4.3, 4.4, 4.7, 4.8 7.1, 7.2, 7.3, 7.5 15.3
3	2	12	12.1, 12.2, 12.3, 12.4
	3	5	5.2, 5.3
4	1	8 & 14	8.1, 8.2, 8.3, 8.4, 8.5.4, 8.8, 8.9 14.1, 14.3, 14.4, 14.5, 14.6, 14.7
5	1	10	10.1, 10.2, 10.3

#### **Reference Book:**

1. Artificial Intelligence by Elaine Rich, Kevin Knight and , Cengage Learning
2. Artificial Intelligence – A Modern Approach by Stuart Russell & Peter Norvig, Pearson

#### **Experiment List: (Practical Programs are to be performed in Turbo Prolog)**

1. Write a program in Prolog to show the working of Arithmetic operators.
2. Write a program in Prolog to show the operations on String.
3. Write a program in Prolog explaining the domains, predicates & clauses section.

4. Write the figure 6.1 medical diagnosis program given in the Prolog book and test it for following: What is the patient's name? He is suffering from which disease?
5. Write a program in Prolog to show the working of fail predicate.
6. Write a program in Prolog to show the working of repeat predicate.
7. Write a program in Prolog to show the working of recursion without repeat predicate.
8. Write a program in Prolog to show the working of cut predicate.
9. Write a program in Prolog to show the working of cut predicate with repeat predicate.
10. Write a program in Prolog to enter inventory parts using a compound object – part (number, description, quantity, cost)

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 32: Cyber Security & Forensic Science**

#### **Rationale:**

- To understand the major concepts of Cyber Security and Forensics and to create the awareness through simple practical tips and tricks and to educate the students to learn how to avoid becoming victims of cyber crimes.
- The subject and the course content will help to the student who wish to take up cyber forensics as career as well as those who want to seek careers in cyber security.
- To gain experience of doing independent study and research in the field of cyber security and cyber forensics.

**Prerequisite:** Basic fundamental knowledge of Networking, Web Application, Mobile Application and Relational Database Management System

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
4	3	2	25	25	50	50	150	

#### **Course Contents:**

##### **UNIT 1: Cybercrime and Cyber Offenses [20%]**

###### **Introduction to Cybercrime:**

Definition and Origins of Cybercrime, Cybercrime and Information Security, Cybercriminals Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usenet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft

###### **Cyber Offenses: How Criminals Plan Them**

Introduction, Categories of Cybercrime, How Criminals Plan the Attacks: Reconnaissance, Passive Attack, Active Attacks, Scanning/Scrutinizing gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, and Classification of Social Engineering, Cyberstalking: Types of Stalkers, How Stalking Works? Real-Life Incident of Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Cybercrime and Cloud Computing

## **UNIT 2: Cyber Crime: Computer and Human Devices**

**[20%]**

### **Cybercrime: Mobile and Wireless Devices**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices Authentication Service Security: Cryptographic Security for Mobile Devices, LDAP Security for Hand-Held Mobile Computing Devices, RAS Security for Mobile Devices, Media Player Control Security, Networking API Security for Mobile Computing Applications, Attacks on Mobile/Cell Phones: Mobile Phone Theft, Mobile Viruses, Mishing, Vishing, Smishing, Hacking Bluetooth, Mobile Devices: Unconventional/Stealth Storage Devices Threats through Lost and Stolen Devices, Protecting Data on Lost Devices, Educating the Laptop Users

### **Phishing and Identity Theft**

Introduction, Phishing: Methods of Phishing, Phishing Techniques, Spear Phishing, Types of Phishing Scams, Phishing Toolkits and Spy Phishing, Phishing Countermeasures, Identity Theft (ID Theft): Personally Identifiable Information(PII), Types of Identity Theft, Techniques of ID Theft, Identity Theft-Countermeasures, How to Protect your Online Identity

## **UNIT 3: Cybercrime Weapons**

**[20 %]**

Password Cracking: Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords

Keyloggers and Spywares: Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares; Steganography: Steganalysis;

DoS and DDoS Attacks: DoS Attacks, Classification of DoS Attacks, Types or Levels of DoS Attacks, Tools Used to Launch DoS Attack, DDoS Attacks, How to Protect from DoS/DDoS Attacks

SQL Injection: Steps for SQL Injection Attack, How to Avoid SQL Injection Attacks

Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks, Theft of Internet Hours and Wi-Fi-based Frauds and Misuses, How to Secure the Wireless Networks

## **UNIT 4: Cyber Security & Cyber Law**

**[20%]**

Intrusion Detection: Component of intrusion detection framework, types, Function of IDS, strengths and limitations

DNS and DNS based vulnerabilities: DNS query, DNs cache, Poisoning cache, countermeasures

Email Security - PGP, S/MIME, Domain key identified mail, spam, protection against spam

### **Cybercrimes and Cyber Security: The Legal Perspectives**

Introduction, Why Do We Need Cyberlaws: The Indian Context, The Indian IT Act: Admissibility of Electronic Records: Amendments made in the Indian ITA 2000, Positive Aspects of the ITA 2000, The Weak Areas of the ITA 2000, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act

## **UNIT 5: Forensics**

**[20%]**

Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence: The Rules of Evidence,Forensics Analysis of E-Mail: RFC282, Digital Forensics Life Cycle: The Digital Forensics Process,The Phases in Computer Forensics/Digital Forensics, Precautions to be Taken when Collecting Electronic Evidence, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation: Typical Elements Addressed in a Forensics Investigation Engagement Contract, Solving a Computer Forensics Case, Setting up a Computer Forensics Laboratory:

Challenges in Computer Forensics: Technical Challenges: Understanding the Raw Data and its Structure, The Legal Challenges in Computer Forensics and Data Privacy Issues, Special Tools

and Techniques: Digital Forensics Tools Ready Recknor, Special Technique: Data Mining used in Cyberforensics, Forensics Auditing, Antiforensics

Cybercrime: Illustrations, Examples and Mini-Cases, Scams  
(Only for the referential context should not be asked in the examination)

### **Real-Life Examples**

- Example 1: Official Website of Maharashtra Government Hacked
- Example 2: E-Mail Spoofing Instances
- Example 3: I Love You Melissa – Come Meet Me on the Internet
- Example 4: Ring-Ring Telephone Ring: Chatting Sessions Turn Dangerous
- Example 5: Young Lady's Privacy Impacted
- Example 6: Indian Banks Lose Millions of Rupees
- Example 7: "Justice" vs. "Justice": Software Developer Arrested for Launching Website Attacks
- Example 8: Parliament Attack
- Example 9: Pune City Police Bust Nigerian Racket

### **Mini-Cases:**

- Mini-Case 1: Cyberpornography Involving a Juvenile
- Criminal Mini-Case 2: Cyberdefamation: A Young Couple Impacted
- Mini-Case 12: Internet Used for Murdering
- Mini-Case 13: Social Networking Victim – The MySpace Suicide Case
- Mini-Case 16: NASSCOM vs. Ajay Sood and Others

### **Online Scams:**

- Scam No. 1 – Foreign Country Visit Bait
- Scam No. 2 – Romance Scam
- Scam No. 3 – Lottery Scam
- Scam No. 4 – Bomb Scams
- Scam No. 5 – Charity Scams
- Scam No. 6 – Fake Job Offer Scam

### **Financial Crimes in Cyber Domain:**

- Financial Crime 1: Banking Related Frauds
- Financial Crime 2: Credit Card Related Frauds

### **Text Books:**

Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives – Nina Godbole, Sunit Belapur, Wiley India Publications Released: April 2011

### **Chapter & Topics –**

- Chapter 1: 1.1 to 1.5
- Chapter 2: 2.1 to 2.8
- Chapter 3: 3.1 to 3.12
- Chapter 4: 4.1 to 4.12
- Chapter 5: 5.1, 5.2, 5.3
- Chapter 6: 6.1, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, 6.10
- Chapter 7: 7.1 to 7.14, 7.16, 7.17, 7.18, 7.19
- Chapter 8: 8.1, 8.3, 8.4, 8.8

**Reference Book:**

- Internet Forensics: Using Digital Evidence to Solve Computer Crime Robert Jones, O'Reilly Media, Released: October 2005
- Windows Forensics: The field guide for conducting corporate computer investigations Chad Steel, Wiley India Publications Released: December 2006

**Experiment List:**

1. TCP scanning using NMAP
2. Port scanning using NMAP
3. TCP or UDP connectivity using Netcat
4. Web application testing using DVWAICustomize web application
5. Manual SQL injection using DVWAICustomize web application
6. XSS using DVWAICustomize web application
7. Automated SQL injection with SqlMap
8. Vulnerability detection in Web application
9. Exploitation
10. Snort, Wiresharkuser.
11. Implement the information hiding and steganography. (Snort).
12. Recover the deleted data and files. (recoverjpeg, recovermov, foremost)

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 33: Cloud Infrastructure & Services**

**Rationale:** The Objective of this subject is

- To study the concept of Virtualization and relevant technologies available in the market
- To understand the importance of Cloud computing for higher throughput
- To make aware about availability of various Cloud platforms

**Prerequisite:** Basic knowledge of Computer Networks, performance of Applications and their throughput.

#### **Learning Outcomes:**

Students will be able to understand the concept of Cloud and its working.

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
4	4	0	25	25	50	0	100	

#### **Course Contents:**

##### **UNIT 1: Introduction to Cloud Computing**

[20%]

Cloud Computing basics, History to Cloud Computing, Importance of Cloud Computing in the Current Era, Characteristics of Cloud Computing and What Cloud Computing Really is?

Move to Cloud Computing: Pros and Cons of Cloud Computing, Nature of Cloud, Technologies in Cloud Computing, Migrating into the Cloud

Types of Cloud: Public and Private Cloud, Cloud Infrastructure

Working of Cloud Computing: Trends in Computing, Cloud Service Models, Cloud Deployment Models, Pros and Cons of Cloud Computing, Cloud Computing and Services

Cloud Architecture: Cloud Computing Logical Architecture, Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Model

Cloud Services: Cloud Types and Services, Software as a Service (SaaS), Platform as a Service (PaaS), Infrastructure as a Service(IaaS), Other Cloud Services

**UNIT 2: Foundations** [20%]

Definition of Virtualization, Adopting Virtualization, Virtualization Architecture and software, Virtual Clustering, Virtualization Applications, Pitfalls of Virtualization

Grid, Cloud and Virtualization: Virtualization in Grid, Virtualization in Cloud, Virtualization in Cloud Security

Virtualization and Cloud Computing: Anatomy of Cloud Infrastructure, Virtual Infrastructures, CPU Virtualization, Network and Storage Virtualization

**UNIT 3: Data Storage & Security** [20%]

Cloud Storage: What is Cloud Storage?, Overview of Cloud Storage, Data Management for Cloud Storage, Provisioning Cloud Storage, Data-intensive Technologies for Cloud Computing

Introduction to Enterprise Data Storage, Data Storage Management, File Systems, Cloud Data stores

Cloud Storage from LANs to WANs: Introduction, Cloud Characteristic, Distributed Data Storage, Applications Utilizing Cloud Storage

Risks in Cloud Computing: Introduction, Risk Management, Cloud Impact, Enterprise Wide Risk Management, Types of Risks in Cloud

Data Security in Cloud: Introduction, Current State, Digital Persona and Data Security, Content Level Security

Cloud Security Services: Objectives, Confidentiality, Integrity and Availability, Security authorization challenges in the Cloud

**UNIT 4: Cloud Applications** [20%]

Parallel Computing, Eras of Computing, High Performance Parallel Computing with cloud and cloud Technologies, Cloud Computing Platforms, Tools for Building Cloud

Microsoft Cloud Services: Introduction, Windows Azure Platform

Google Cloud Applications: Google Applications Utilizing Cloud, Google App Engine

Amazon Cloud Services: Understanding Amazon Web Components and Services, Elastic Compute Cloud (EC2), Amazon Storage System, Amazon Database Services

**UNIT 5: Case studies & Future Cloud** [20%]

Case Studies: Dell, Wipro, Razorfish and Japan Post

Future Trends: Emerging Future trends in Cloud Computing, Next Generation Networking (NGN)

Mobile Cloud Architecture & its Key requirements, Jungle Computing

**Text Books:**

1. "Cloud Computing A practical approach for learning and implementation" by A.Srinivasan and J.Suresh Pearson Publications (Unit # : 1,2,3,4)

## **Chapter & Topics –**

<b>Unit #</b>	<b>Chapters</b>
Unit 1	1, 2, 3, 4, 6, 16
Unit 2	8, 9, 10
Unit 3	11, 12, 13, 18, 19, 20
Unit 4	24, 29, 30, 31
Unit 5	33, 34, 38, 39 (39.5, 39.6.2, 39.6.4, 39.6.5)

## **Reference Book:**

1. Cloud Computing: A practical approach by Anthony T. Vetle – Tata McGraw Hill Education Private Limited (2009)
2. OpenStack Cloud Security by Fabio Alessandro Locati, Packt Publishing
3. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More (Student Edition) - Kris Jamsa- Published by - Jones & Bartlett Learning
4. Cloud Computing Bible - Barrie Sosinsky – Wiley India Pvt Ltd (2011)
5. Rajkumar Buyya, Christian Vechhiola, S.Thamarai Selvi, “Mastering Cloud Computing”, McGraw Hill Education (India) Private Limited.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 34: Machine Learning**

#### **Rationale:**

The primary objective of this course is to provide a broad introduction to machine learning and its application.

**Prerequisite:** Knowledge of statistics, linear algebra, optimization, and core fundamentals of computer science to create automated systems that can sift through large volumes of data at high speed to make predictions or decisions without human intervention.

#### **Learning Outcomes:**

Students will learn seven concepts like basics of machine learning, linear regression and logistic regression, neural network representation, Decision Tree, bayes learning, support vector machine, unsupervised learning and basics of deep learning.

1. In introduction to Machine learning, they will understand the types of machine learning and its applications and basics of deep learning.
2. In linear regression and logistics regression they will understand one variable model, classification, hypothesis representation, cost function etc.
3. In neural network they will learn about perceptron learning and model representation.
4. In decision tree and bayes learning they will learn about decision tree algorithms and bayes learning techniques.
5. In unit 5 they will learn about support vector machine and unsupervised learning algorithms.
6. All these concepts are important to build their career as Machine teaching Engineers, Data Scientist and Business intelligence developers.

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr			Th	Th.	
4	3	2	25	25	50	50	150

#### **Course Contents:**

##### **UNIT1: Introduction to Machine Learning**

[20%]

Need for Machine Learning, Types of Machine Learning: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Applications of Machine Learning, Type of Data in Machine Learning, Data quality and data pre-processing, Tools in Machine Learning.

## **UNIT2: Modeling, Evaluation, Feature Engineering and Bayesian Concept Learning [20%]**

Selecting Model, Training Model, Model Representation and interpretability, evaluating performance of a mode, improving performance of model, define feature engineering, feature transformation, feature subset selection, Bayesian theorem and concept learning.

## **UNIT 3: Supervised Learning: Classification and Regression [20%]**

Introduction to supervised learning, its examples, classification model, classification learning steps, classification algorithms: k-nearest neighbor (kNN), Decision Tree, Random forest, Support Vector Machine (SVM), introduction to regression and its examples, Regression algorithms: simple linear regression, multiple linear regression, problems in regression analysis, logistic regression.

## **UNIT 4 : Unsupervised Learning : Clustering and Finding Patterns [20%]**

Introduction to unsupervised learning, supervised learning vs unsupervised learning, application of unsupervised learning, clustering: types of clustering techniques, partitioning methods, k-medoid, hierarchical clustering, density based methods-DBSCAN, Finding patterns using association rules, apriori algorithm.

## **UNIT 5: Basics of Neural Network [20%]**

Introduction, artificial neuron, types of activation functions, implementation of ANN, Architectures of Neural Network, Learning process in ANN, Active learning, Memory based learning, bootstrap aggregation (bagging) , boosting, gradient boosting machines(GBM), Introduction to Deep Learning and its need and applications.

### **Text Books:**

1. Machine Learning, 1st Edition by Pearson (English, Paperback, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das)
2. Sebastian Raschka, "Python Machine Learning", PACKT publishing.

### **Reference Books:**

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997. ISBN 0070428077
2. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, 2004
3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
4. Richard O. Duda, Peter E. Hart & David G. Stork, "Pattern Classification. Second Edition", Wiley & Sons, 2001.
5. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The elements of statistical learning", Springer, 2001.
6. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", MIT Press, 1998.

### **Web Material:**

1. <https://www.youtube.com/watch?v=fgtUFzxNztA>
2. <http://nptel.iitm.ac.in/video.php?courseId=1041>
3. <http://www-formal.stanford.edu/jmc/whatisai/whatisai.html>
4. [http://www.webopedia.com/TERM/A/artificial\\_intelligence.html](http://www.webopedia.com/TERM/A/artificial_intelligence.html)
5. [http://en.wikipedia.org/wiki/Artificial\\_intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence)

## **Chapter & Topics –**

<b>Unit #</b>	<b>Book</b>	<b>Chapters</b>
Unit 1	1	1,2
Unit 2		3,4,6
Unit 3		7,8
Unit 4		9,10
Unit 5		11

**Note: Practicals can be performed using Python/appropriate Open Source Tools**

### **Practical List: (Book1, Book2)**

1. Classifying with distance measures,
2. Naïve Bayes algorithm for predictability of a model

#### **Supervised Learning -Classification Algorithms:**

3. k-nearest neighbor (kNN),
4. Decision Tree,
5. Random forest,
6. Support Vector Machine (SVM),
7. Simple Linear Regression

#### **Unsupervised Learning –Clustering Algorithms:**

8. partitioning methods,
9. hierarchical clustering,
10. density based methods-DBSCAN,
11. Finding patterns using association rules, apriori algorithm
12. Procuring Cognitive Neural network
13. Training and Validation of Cognitive Neural network
14. Understanding and Classification of Brain neurons
15. Clustering of facial expressions through neurons.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 35 : Internet of Things**

#### **Rationale:**

The primary objective of this course is to interpret the vision of IoT from a global context.

**Prerequisite:** Fundamentals of computer networks, wireless sensor networks, fundamental of embedded system, sensors, web technology.

#### **Learning Outcomes:**

Students will learn seven concepts like basics of internet of things.

1. Understand the concepts of Internet of Things
2. Design IoT applications in different domain and be able to analyze their performance
3. Implement basic IoT applications on embedded platform
4. All these concepts are important to build their career in broad perspective in the domain of IoT.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total
	Th	Pr	Th	Th	Th.	Pr.	Marks
4	3	2	25	25	50	50	150

#### **Course Contents:**

##### **UNIT1: Introduction to Internet of things [20%]**

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, Smart Objects: Sensors and actuators (LCD, LED, PIR, IR, Ultrasonic, Temperature , humidity, pressure, gas, bluetooth, GSM,Zigbee, etc)

##### **UNIT2: Internet of Things and M2M [20%]**

**IoT to M2M : A Basic Perspective**— Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

**IoT to M2M : An Architectural Overview**— Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

**UNIT 3: Architecture of IoT****[20%]**

IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model-Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

**UNIT 4: IoT Applications, Challenges, Privacy , Security and Governance****[20%]**

Introduction, IoT applications for industry: Smart Objects, Smart Applications, Value Creation from Big Data and Serialization, Home Automation, eHealth, Surveillance applications, Other IoT applications. Design challenges, Development challenges, Security challenges, other challenges, Security, Overview of Governance, Privacy and Security Issues, Data Aggregation for the IoT in Smart Cities.

**UNIT 5: Developing IoTs****[20%]**

Introduction to different IoT tools, developing applications through IoT tools, developing sensor based application through embedded system platform, Implementing IoT concepts with python.

**Text Books:**

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. David Hanes, Rob Barton, "IoT fundamentals: networking technologies, protocols and use cases for the internet of things by pearson

**Reference Books:**

1. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
2. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
3. Gastón C. Hilla, Internet of Things with Python, Packt Publication.
4. Waltenegeus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

**Note: Practicals can be performed using Python and appropriate open source platform Practical Topics:**

1. Working with LED,SWITCH
2. Interfacing LCD with Arduino
3. Interfacing PIR sensor with Arduino
4. Interfacing temperature sensor (LM35) with Arduino
5. Interfacing DHT sensor with Arduino
6. Interfacing Ultrasonic sensor with Arduino
7. Configuring Bluetooth Module using AT commands
8. Bluetooth to Bluetooth communication: Bluetooth module to mobile/computer communication
9. ZigBee to ZigBee communication
10. Configuring the NodeMCU as Wi-Fi
11. Sensor interfacing with SBC using python
  - a) PIR
  - b) Temperature
  - c) DHT

d) Ultrasonic

**List of Open Source Software/learning website:**

- <https://github.com/connectIOT/iottoolkit>
- <https://www.arduino.cc/>
- <http://www.zettajs.org/>
- Contiki (Open source IoT operating system)
- Arduino (open source IoT project)
- IoT Toolkit (smart object API gateway service reference implementation)
- Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 36(A) : Software Testing & Quality Assurance**

#### **Rationale:**

The objective of this course is to understand the basic view of software quality and quality factors, to understand the Software Quality Assurance (SQA) architecture and the details of its components and to understand of how the SQA components can be integrated into the project life cycle.

**Prerequisite:** Software Engineering Basics

**Learning Outcome:** Students will learn how to perform testing, how to develop test cases and how to assure Quality in the software.

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
4	3	2	25	25	50	50	150	

#### **Course Contents:**

##### **UNIT 1: Introduction to Software Testing**

[20%]

Testing as an Engineering Activity, Role of Process in Software Quality, Testing as a Process, Basic Definitions, Software Testing Principles, The Tester's Role in a Software Development Organization, Origins of Defects, Defect Classes, The Defect Repository and Test Design, Defect Examples, Developer / Tester Support for Developing a Defect Repository.

##### **UNIT 2: Test Case Design**

[20%]

Introduction to Testing Design Strategies, The Smarter Tester, Test Case Design Strategies, Using Black Box Approach to Test Case Design Random Testing, Requirements based testing, positive and negative testing, Boundary Value Analysis, decision tables, Equivalence Class Partitioning state-based testing, cause- effect graphing, error guessing, compatibility testing, user documentation testing, domain testing Using White-Box Approach to Test design, Test Adequacy Criteria, static testing vs structural testing, code functional testing, Coverage and Control Flow Graphs, Covering Code Logic, Paths –Their Role in White–box Based Test Design, code complexity testing, Evaluating Test Adequacy Criteria.

##### **UNIT 3: Levels of Testing**

[20%]

The need for Levels of Testing, Unit Test, Unit Test Planning, & Designing the Unit Tests. The Test Harness, Running the Unit tests and Recording results, Integration tests, Designing Integration Tests, Integration Test Planning, scenario testing, defect bash elimination, System Testing, types of system

testing, Acceptance testing, performance testing, Regression Testing, Alpha – Beta Tests – testing OO systems – usability and accessibility testing.a

#### **UNIT 4: SQA components in the project life cycle**

**[20%]**

Software Quality and its factors, SQA Components, Integrating quality activities in the project life cycle, Reviews, Software testing – strategies and implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality.

Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control

#### **UNIT 5: Management components of software quality, Organizing for quality assurance [20%]**

Software quality metrics, Costs of software quality, Scope of quality management standards, ISO 9001, Certification, Capability Maturity Models – CMM and CMMI, Assessment methodology, Management and its role in software quality assurance, The SQA unit and other actors in the SQA system.

#### **Text Books:**

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson education, 2006.
2. Aditya P.Mathur, “Foundations of Software Testing”, Pearson Education, 2008.
3. Daniel Galin, “Software Quality Assurance”, Pearson Publication, 2009

#### **Reference Book:**

- Ron Patton, “Software testing” , second edition, Pearson education, 2009.
- Boris Beizer, “Software Testing Techniques”, Second Edition,Dreamtech, 2003
- Elfriede Dustin, “Effective Software Testing”, First Edition, Pearson Education, 2003
- Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997.
- Mordechai Ben-Menachem “Software Quality: Producing Practical Consistent Software”, International Thompson Computer Press, 1997.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 36(B): Advanced Web Development Technologies**

#### **Rationale:**

The purpose of this course is to give students an understanding of MVC architecture, implementing MVC architecture in entity framework and working with advanced databases. This course covers advanced topic in ASP.NET with JSON, AJAX, JQUERY and Web API so that student can develop any web based advanced projects for the industry.

**Prerequisite:** Knowledge of Client Server Architecture, Use of Controls & Server, database, ASP.Net web services

#### **Learning Outcomes:**

This Course Covers -

- Developing web application using MVC Architecture
- Working with Entity Framework
- Implementing JSON, AJAX, JQUERY and Web API

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th.	Pr.			
4	3	2	25	25	50	50	150	

#### **Course Contents:**

##### **UNIT 1: Introduction ASP.NET** [20%]

Introducing ASP.NET MVC 4: What Is ASP.NET? | ASP.NET Web Pages | ASP.NET MVC

Installing ASP.NET MVC 4: Software Requirements for ASP.NET MVC4 | Installing ASP.NET MVC4 Server Components | Visual Studio Application Templates | Anatomy of ASP.NET MVC 4 Internet Application

ASP.NET MVC 4 Web Application: Description of the Application | Creating the Database

##### **UNIT 2: MVC Architecture, Forms and HTML Helpers** [20%]

Understanding Controllers: The Routing Engine | Creating Controllers | Working with Action Methods

Understanding Views: View Engines | Working with Views | The Rendering Process | Understanding the Razor View Engine | Working with ViewData and ViewBag | Working with Strongly Typed Views | Understanding ASP.NET MVC Mobile features

Understanding Models: What Are Models? | Adding a Business Model | Adding View Models | Understanding Model Binding

Using Forms and HTML Helpers: The Action and the Method, (GET or POST), HTML Helpers, Other Input Helpers, Rendering Helpers

### **UNIT 3: Data, AJAX, jQuery, & Web API** [20 %]

Data validation: The Validation Workflow | Manual Validation | Validation with Data Annotations | Creating Custom Data Annotations

AJAX and JQuery: Introducing JQuery | Understanding Unobtrusive Javascript | Working with Ajax | Working with JSON | Introducing Web API

Security: Authentication and Authorization | Securing Controllers and Action Methods | Authenticating with External Sources | Implementing Membership and Roles | Securing ASP.NET MVC Applications Against External Attacks

### **UNIT 4: Testing Application** [20%]

Routing: Routing Concepts | Creating Custom Routs | Creating a Catch-all Segment | Adding Constraints to Routes | Understanding when Routing is Not Applied | ASP.NET Routing Vs. URL Rewriting | Generating Links and URLs

Testing the Application: Understanding Unit Testing | Examining the Test Project | Testing Controllers | Testing Routes

### **UNIT 5: Deploying Application** [20%]

Preparing the Application for Deployment | Deploying to an In-House Server | Deploying to Windows Azure

#### **Text Book:**

1. Beginning ASP.NET MVC 4, Jose Rolando Guay Paz, Apress
2. Professional ASP.NET MVC 5, Jon Galloway, Brad Wilson, K. Scott Allen, David Matson, Wrox Publication

#### **Chapter wise coverage**

- Unit 1: CH# 1, 2, 3 of Book-1
- Unit 2: CH# 4, 5, 6 of Book-1 and CH# 5 of Book-2
- Unit 3: CH# 7, 8, 9
- Unit 4: CH# 10, 11, 12

#### **Reference Books & Links**

1. Pro Asp.Net MVC 5, Adam Freeman, Apress
2. <http://www.asp.net/web-api/overview/older-versions>
3. <http://www.asp.net/mvc/overview/older-versions/getting-started-with-ef-5-using-mvc-4/implementing-basic-crud-functionality-with-the-entity-framework-in-an-asp-net-mvc-application>

#### **Practical List**

##### **Getting Started with ASP.NET MVC 4**

1. Intro to ASP.NET MVC 4
2. Adding a Controller
3. Adding a View
4. Adding a Model

5. Accessing Your Model's Data from a Controller
6. Examining the Edit Methods and Edit View
7. Adding a New Field to the Movie Model and Table
8. Adding Validation to the Model
9. Examining the Details and Delete Methods

### **Getting Started with EF5 using MVC 4**

1. Creating an Entity Framework Data Model
2. Implementing Basic CRUD Functionality
3. Sorting, Filtering, and Paging
4. Creating a More Complex Data Model
5. Reading Related Data
6. Updating Related Data
7. Handling Concurrency
8. Implementing Inheritance
9. Implementing the Repository and Unit of Work Patterns
10. Advanced Entity Framework Scenarios

### **API**

1. Enabling CRUD Operation in Web API 1
2. Using ASP.NET Web API1 with EF5

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 36(C) : Digital Marketing**

#### **Rationale:**

The primary objective of this course is to provide technical and managerial skill development in area of digital marketing.

**Prerequisite:** Knowledge of internet, www, web site, e-commerce, m-commerce, mobile application, etc.

#### **Learning Outcomes:**

Students will learn how to use the internet as an effective marketing channel. Enables students to engage with customers online in a more practical manner and to plan and implement end-to-end lead generation through the online mode. In this course students will learn in depth concepts as listed to shape their career in digital marketing.

- Digital Marketing Introduction
- Search Engine Optimization.
- Social Media Marketing and strategies
- E-mail and mobile marketing
- Understanding Mobile and Web Analytics
- All these concepts are important to build their career as Marketing analyst, Email marketer, Digital marketer, SEO proficient, Social Media Advertiser, Content Marketer/writer.

**Teaching and Evaluation Scheme:** The objective of evaluation is to evaluate the students throughout the semester for better performance. Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th.	Pr.			
4	3	2	25	25	50	50	150	

#### **Course Contents:**

##### **Unit 1: Digital Marketing Introduction**

**[20%]**

**Understanding synergistic digital ecosystem:** The evolution of the digital ecosystem, Data Growth Trends, digital media types, Competitive Intelligence, Click Stream, Conversion Analytics, Custom segmentation, Visual overlays, social media reporting , user experience feedback, real-time site analytics, Understanding digital analytics : Apply a measurement framework , determining your owned and earned, Demystifying web data, digital advertising concepts , searching for the right metrics, aligning digital and traditional

**Unit 2: Search Engine Optimization [20%]**

Introduction, key terms and concepts, on-site SEO: Optimize UX & Design, Off-Site SEO: Link-building, SEO Audit & Future of SEO, Search Engine Marketing: AdWords & key word selection, create text ads, CPC building, navigate AdWords, SEM metrics & Optimization, conversion optimization.

**Unit 3: Social Media Marketing and strategies [20%]**

Social media landscapes, social media channels, social media content, implement and monitor campaigns, impact measuring. Social Media Advertising (paid), platforms for social ads, create ad sets, create and manage ads, social media channels, content creation, social media strategies.

**Unit 4: E-mail and mobile marketing [20%]**

Introduction, e-mail strategy and planning, step by step process, create and effective email campaigns, role of mobile in personal communication, mobile messaging channels, mobile commerce, advantages and challenges.

**Unit 5: Understanding Mobile and Web Analytics [20%]**

Data analytics, Understanding the Basics of Search, Search Analytics Use Cases, Free Tools for Collecting Insights Through Search Data: Google Trends | YouTube Trends | The Google AdWords Keyword Tool | Yahoo! Clues , Paid Tools for Collecting Insights Through Search.

Data, Understanding the Current Mobile Market Landscape, Growth in Smartphone Adoption, The Battle Between iOS and Android, The Explosion of Global Mobile Web Traffic, The Introduction of Mobile Advertising

**Text Books:**

1. Digital Marketing Analytics Second Edition, Chuck Hemann, Pearson
2. eMarketing\_ The Essential Guide to Digital Marketing, Rob Stokes
3. Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World, chuck hemann ken burbary, QUE

**Reference Books:**

1. Ryan Damian Ryan, "Understanding Digital Marketing ", 3<sup>rd</sup> edition, Kogan Page.
2. essential-digital-marketing-tools-smart-insights, Smart Insights
3. Nick smith, "Successful seo and search marketing in a week" Hodder & Stoughton
4. Macarthy Andrew Macarthy, "500 social media marketing", Createspace independent pub.
5. P R Smith E-marketing, "Excellence:-planning optimization your digital marketing", Routhledge.
6. Chuck Hemann Ken Burbary, "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World", QUE
7. Digital marketing handbook, <http://emarketingconsult.com/digital-marketing-handbook-2012>

## **Chapter & Topics –**

<b>Unit #</b>	<b>Book</b>	<b>Chapters</b>
Unit 1	1	1,2
Unit 2	2	9,19
Unit 3	2	14,15
Unit 4	2	16,17
Unit 5	2	18
	3	5,20

### **Practical List:**

1. Articulate marketing objective
2. Strategy planning
3. Organic SMM: market your content
4. Paid Social Media Advertising
5. SEO
6. SEM: run AdWord Campaign
7. Display Advertising: evaluate display ad campaign
8. PPC
9. Email Marketing
10. Web analytics

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 36(D) : Blockchain Technology**

#### **Rationale:**

The primary objective of this course is to provide a broad introduction to Blockchain and its application. Blockchain is the distributed and decentralized database technology behind this crypto currency. This course explores the fundamentals of the public, transparent, secure, immutable and distributed database called blockchain. Blockchains can be used to record and transfer any digital asset not just currency. This course will introduce students to the workings and applications of this potentially disruptive technology. Its potential impact on financial services, government, banking, contracting and identity management will be discussed.

**Prerequisite:** basics of centralized and distributed database and network technologies.

#### **Learning Outcomes:**

Students will be able to achieve the following learning objectives at the completion of the course.

1. They will be able to discover blockchain technology.
2. They will be able to learn and explain why we need blockchain. What is the real world problem(s) that blockchain is trying to solve,Understand and describe how blockchain works,Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building, How does blockchain exist in the public domain (decentralized, distributed) yet maintain transparency, privacy, anonymity, security, immutability, history.
3. They will be able to understand that How is blockchain simulated without any central controlling or trusted agency and How bitcoin cryptocurrency works.
4. They will be able to understand Why people value a ‘digital’ currency, how it can be protected against scam, fraud, hacking and devaluation.
5. They will be able to design and implement new ways of using blockchain for applications other than cryptocurrency and explore platforms such as Ethereum to build applications.
6. All these concepts are important to build their career as Blockchain generalist, blockchain developers and Blockchain contract developer.

**Teaching and Evaluation Scheme:** Students are evaluated on the basis of continuous evaluation system both in theory and practical classes based on various parameters like term work, class participation, practical and theory assignments, presentation, class test, Regular Attendance, etc.

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total
	Th	Pr	Th	Th	Th.	Pr.	Marks
4	3	2	25	25	50	50	150

## **Course Contents:**

**UNIT1: Discover Blockchain Technology** [20%]  
Introduction: History of centralized services, trusted third party for transactions, Making a case for a trustless system, Understand the differences between centralised, decentralised and distributed peer to peer networks, Why blockchain, Decentralized transactions, No permission for transactions needed, Types of Blockchain (Permission Blockchain vs. Permissionless Blockchain), History of Bitcons: How and when blockchain/bitcoin started, Milestones on the development of bitcoin, The problem area and promise of bitcoin, Relation to bitcoin, Requirements for blockchain in a business environment, Requirements deep dive, Sharing economy, Internet of Value.

**UNIT2: Fundamental concepts of Blockchain** [20%]  
Overview of blockchain technology: What is blockchain, Transactions, Blocks, Hashes, Consensus, Verify and confirm blocks, Hashes: Hash cryptography, Encryption vs hashing, Transactions: Recording transactions, Digital signature, Verifying and confirming transactions, Blocks and blockchain: Hash pointers, Blocks, Consensus building: Distributed consensus, Byzantine generals problem, Consensus mechanisms: POW, POS, POB, POA, POET, etc., Blockchain Architecture, Merkle Root Tree, blockchain and future world of Web 3.0.

**UNIT 3: Mining and simulating blockchain** [20%]  
Mining and simulating blockchain: Game theory behind competitive mining, Race to beat the others (including hackers), Incentives – mining and transaction fees, CPU considerations, Energy expended in mining, Profitability, Mining pools, Blockchain for Bigdata

**UNIT 4 : Bitcoins, Security and Safeguard** [20%]  
Bitcoin: Bitcoin creation and economy, Bitcoin exchanges, Bitcoin limited supply and deflation? Famous hacks, Wallets, Security and safeguards: Protecting blockchain from attackers, Forks – soft and hard, Blockchain Security : Key Management in Bitcoin, Case Studies.

**UNIT 5: Platforms and Applications** [20%]  
Introduction to Blockchain platform: Ethereum, Hyperledger, IOTA, EOS, Multichain, Bigchain, CORDA, Openchain, SOLIDITY, Design a new blockchain, Potential for disruption, How to incentivize blockchain, Design a Distributed Application (DAPP), Blockchain applications: Government, Identity management, Auto executing contracts, Three signature escrow, Triple entry accounting, Elections and voting?, Property records, titles, Micropayments, Notary, Sidechains, Blockchain Smart Contracts, Challenges and Research Issues in Blockchain.

## **Text Books:**

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayana.
2. Blockchain Basics 2019: The New Updated Inves...(Paperback), by Bradley Lakeman

## **Reference Books:**

1. Blockchain: Step-By- Step Guide to Understand by Paul Laurence
2. Introducing Ethereum and Solidity Foundations of Cryptocurrency and Blockchain Programming for Beginners by Chris Dannen , Apress
3. Hands-On Blockchain for Python Developers: Gain blockchain programming skills to build decentralized applications using Python Paperback
4. Building Blockchain Projects (English, Paperback, Prusty Narayan), Packt
5. Blockchain: The comprehensive beginner's guide, (Paperback),by frank walrthin
6. Ultimate Blockchain Technology, Mega Edition – Six Books – Best Deal For Beginners in

Blockchain, Blockchain Applications, Cryptocurrency, Bitcoin, Mining and Investing by Lee Sebastian

7. Blockchain And Decentralized Systems(Paperback) by Pavel Kravchenko, Bohdan Skriabin
8. Masters of Blockchain, Digital Assets & the N...(Paperback), by Andrew Romans, Tim Draper

### **Web References:**

1. <https://bitcoin.org/bitcoin.pdf>
2. <http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf>
3. <https://www.evry.com/globalassets/insight/bank2020/bank-2020---blockchain-powering-the-internet-of-value---whitepaper.pdf>
4. <https://media.consensys.net/programmable-blockchains-in-context-ethereum-s-future-cd8451eb421e#.z4788f3kx>
5. <https://github.com/anders94/blockchain-demo>
6. <http://blockchain.mit.edu/how-blockchain-works>
7. <https://anders.com/blockchain/>
8. <http://learnmeabitcoin.com/>

### **Live Map or Reachable Nodes**

9. <https://bitnodes.earn.com/nodes/live-map/>

### **Realtime Bitcoin Globe**

10. <https://blocks.wizb.it/>

### **Unconfirmed Transactions Visualization**

11. <http://dailyblockchain.github.io/>

**Note: Practical can be performed using Open Source Ethereum /Truffle/IBM platform/Solidity/ etc.**

### **Tentative List of Praticals :**

1. Explore various popular blockchain applications. Create a list of those applications and the industries/businesses they are impacting
2. Explore the bitcoin blockchain on blockchain.info
3. Use an online service to generate hashes for content
4. Build a transaction and then hash it. Generate public and private keys. Digitally sign a transaction
5. Explore the bitcoin blockchain on blockchain.info for block generation. Explore how long it takes a block to be confirmed.
6. Use an online service to illustrate how consensus is built in a distributed system with no central authority.
7. What is the computing power needed to mine and generate bitcoin? Explore if miner pools are dominating bitcoin mining. Compare incentives from mining activity vs transaction fees.
8. Install a bitcoin wallet. Generate and secure your private key.
9. Send a small transaction amount (to be monetized by instructor) to another user. Track the transaction through blockchain. Verify the confirmation and commitment of the transaction to the bitcoin blockchain.
10. Pick three industries. Research the application of blockchain in those industries. Describe how blockchain could be successful in those industries.
11. Set up the Hyperledger Composer Playground
12. Transfer assets in a blockchain network
13. Explore editor views archive data

14. Create Decentralised application such as Elections.(Using Truffle framework, metamask, ganache)
15. Writing script to create block, perform transaction and validate and verify (mining) using any programming language such as **python, node js, javascript, java**.
16. Implementing smart contract using solidity on **Remix** (<https://remix.ethereum.org/#optimize=false&version=soljson-v0.5.1+commit.c8a2cb62.js>). It is online IDE that is use to execute and test smart contract.
17. Installing and configure **Ganache** which is in memory local platform for blockchain (<https://truffleframework.com/ganache>). Install and configure **Metamask** which is available in different extension with browser. Install chrome extension of metamast. Import account from Ganache into metamask and perform transaction and observe block.

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester III**

### **MCA - 37 : Mini Project - II**

#### **Rationale:**

The students would be developing a Client Server application which will enable them to use the concepts of system development and analysis. More focus would be on requirement analysis, preparation of SRS, design consideration and design documentation, translation of design to prototypes, implementation and review of prototypes.

#### **Learning Outcome:**

At the end of the project students will be able to understand the importance of system analysis and design in implementation of a project, which would be of great help in developing a real time project in the later semesters.

#### **Teaching and Guiding Scheme:**

Students have to develop project either in the institute or in some industry. They have to undergo sincere work under the guidance of faculty members as internal guides as well as external guides from the industry. Regular feedbacks and presentations will be conducted.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
2	-	4	-	25	-	25	50	

**Practical:** Visual Studio, JDK, Android SDK, SDK for windows phone or any other tool (as applicable) will be used.

#### **Evaluation Scheme:**

**Internal:** [ IA + IB + IC ] : [ 10 + 10 + 5 = 25 ]

IA – Project Analysis

IB – Project Design & Development

IC – Project Implementation & Testing

**External:** [ EA + EB + EC ] : [ 10 + 10 + 5 = 25 ]

EA – Project Analysis

EB – Project Design & Development

EC – Project Implementation & Testing

# **SEMESTER – IV**

# **Kadi Sarva Vishwavidyalaya, Gandhinagar**

## **MCA Semester IV**

### **MCA - 41: Industry Project**

#### **Rationale:**

The students would be developing a live project which will enable them to use the concepts of Software Project Management and Software Engineering. More focus would be on Risk analysis, Planning & Monitoring, Defect Removal and most importantly Quality Assurance.

#### **Learning Outcomes:**

Students will come out as complete Software Engineer who will be ready to work in the Industry atmosphere and its deadlines

#### **Teaching and Guiding Scheme:**

This is a full time live project so the students will undergo sincere work under the guidance of faculty members as internal guides as well as external guides from the industry. Regular feedbacks and presentations will be conducted.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks	
	(per week)		MID	CEC	External			
	Th	Pr	Th	Th	Th.	Pr.		
24	16 Week (48 Hrs at Industry Side per week)		-	200	-	500	700	

**Practical:** Visual Studio, JDK, Android SDK, SDK for windows phone or any other tool (as applicable) will be used for practical programs

#### **Evaluation Scheme:**

$$\text{Internal: } [\text{IA} + \text{IB} + \text{IC} + \text{ID}] : [20 + 60 + 80 + 40 = 200]$$

IA – Project Definition

IB – Project Analysis

IC – Project Design & Development

ID – Project Implementation & Testing

$$\text{External: } [\text{EA} + \text{EB} + \text{EC} + \text{ED}] : [50 + 150 + 200 + 100 = 500]$$

EA – Project Definition

EB – Project Analysis

EC – Project Design & Development

ED – Project Implementation & Testing