V Semester

DATA ANALYTICS (Theory & Practice)					
Course Code	**:**	**16MCA51**	**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P:S 4:0:2:0**	**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. To explore the fundamental concepts of data analytics
2. To understand the applications using Map Reduce Concepts
3. To introduce programming tools PIG & HIVE in Hadoop echo system
4. To understand the various search methods and visualization techniques

Unit – I – Introduction to Data Analytics & Hadoop Eco System	**10 Hrs**

Hadoop Fundamentals

Data, Data Analysis and storage, Comparison with other systems – Relational Database Management Systems, Grid Computing, Volunteer Computing, History of Apache Hadoop

The Hadoop Distributed Filesystem

The Design of HDFS, HDFS Concepts – Blocks, Name nodes and Data nodes, Block Caching, HDFS Federation, HDFS High Availability,

The command-Line Interface, Hadoop Filesystem – Interfaces

The Java Interface – Reading data from Hadoop URL, Reading Data using FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data

Data Flow – Anatomy of a File Read, Anatomy of a File Write, Coherency Model

Parallel Copying with distcp – Keeping an HDFS cluster Balanced

Unit – II – Map Reduce	**10 Hrs**

Map Reduce - A Weather Dataset – Data format, Analyzing the data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming

Working of Map Reduce - Anatomy of a Map Reduce Job Run, Failures, Shuffle and Sort, Task Execution

Map Reduce Formats - Input Formats, Output Formats

Unit – III - Pig	**09 Hrs**

Pig Environment – Execution types, Running Pig programs, Grunt, Pig Latin Editors

An Example – Generating Examples, Comparison with databases

Pig Latin – Structure, Statements, Expressions, Types, Schemas, Functions, Macros

User-Defined Functions – A Filter UDF, An Eval UDF, A Load UDF

Data Processing Operators – Loading and storing of data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and splitting Data

Pig in Practice – Parallelism, Anonymous Relations, Parameter Substitution

Unit – IV - Hive	**09 Hrs**

Installing Hive – The Hive shell, An Example; Running Hive – Configuring hive, Hive services, the

Meta store

Comparison with Traditional Databases – Schema on Read Versus Schema on Write, Updates, Transactions and Indexes, SQL-on-Hadoop Alternatives

Hive QL – Data Types, operators and functions

Tables – Managed Tables and External Tables, Partitions and Buckets, Storage Formats, Importing Data, Altering Tables, Dropping Tables

Querying Data – Sorting and Aggregating, Map Reduce scripts, Joins, Sub queries, Views

User Defined Functions – Writing a UDF, writing a UDAF

Unit – V Data Visualization	**10 Hrs**

Data Visualization – I – Introduction, Techniques used for visual Data Representation, Types of Data Visualization, Applications of Data Visualization, Visualizing Big Data, Tools used in Data Visualization, Tabeleau Products

Data Visualization with Tabeleau – Introduction to Tabeleau software, Tabeleau Desktop Workspace, Data Analytics in Tabeleau Public, Using visual controls in Tabeleau Public

Unit – VI (Lab Component)

PART A

1 --- HDFS

Review the commands available for the Hadoop Distributed File System:

2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS

2 --- Map Reduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

3 --- Map Reduce

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie

6. List all the Movies with the max, min, average ratings given by any user

4 – Extract facts using Hive

In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database. The moveapp_log_json table contains an activity column. Activity states are as follows:

1. RATE_MOVIE
2. COMPLETED_MOVIE
3. PAUSE_MOVIE
4. START_MOVIE
5. BROWSE_MOVIE
6. LIST_MOVIE
7. SEARCH_MOVIE
8. LOGIN
9. LOGOUT
10. INCOMPLETE_MOVIE

1.Write a query to select only those clicks which correspond to starting, browsing, completing, or purchasing movies. Use a CASE statement to transform the RECOMMENDED column into integers where 'Y' is 1 and 'N' is 0. Also, ensure GENREID is not null. Only include the first 25 rows.

2. Write a query to select the customer ID, movie ID, recommended state and most recent rating for each
movie.

3. Load the results of the previous two queries into a staging table. First, create the staging table:

4. Next, load the results of the queries into the staging table

5 Extract sessions using Pig

Group the log sample by movie and dump the resulting bag.

2. Add a GROUP BY statement to the sessionize.pig script to process the click stream data into user sessions.

6.Consider the superstore data set https://community.tableau.com/docs/DOC-1236,

a. Build a Bar Chart that displays total sales over four year period

b. Add totals to show the stacked bars

c. Build a bar chart view as shown below that displays a list of technology products and how much profit each has generated.

PART –B

1. **Build a word cloud using text mining tools of R.**
   - Identify & create text files to turn into a cloud
   - Create a corpus from the collection of text files
   - Data processing on the text files
   - Create structured data from the text file
   - Making the word cloud using the structured form of the data
2. **Social Network Analysis and Visualization using R**
   - Show the various centrality scores such as degree, between's, closeness, Transitivity
   - Show Neighborhood of graph vertices

- Find Cliques
- Display maximal connected components of a graph
- Calculate cohesive blocks

3. Sentiment Analysis for i) sales of products ii)Customer relationship services using R

- Load the required data set
- Perform stemming and cleaning
- Display the sentiment score for Neutral, Positive polarity and Negative Polarity (Visualization)

Expected Course Outcomes

After going through this course the student will be able to

CO1: Understand the fundamentals of data analytics techniques and platforms

CO2: Design and Apply data analytics ecosystem and visualization techniques to solve various problems

CO3: Analyze the results of data analytics and visualization for various problems

CO4: Evaluate the solutions of data analytics ecosystems

Reference Books:

1	Tom White, "Hadoop – The Definitive Guide; Storage and Analysis at Internet scale", O'Reilly, Shroff Publishers & Distributers Pvt. Ltd., 4th Edition, 2015, ISBN – 978-93-5213-067-2
2	DT Editorial Services "Big Data – Black Book" Dreamtech Press, Edition – 2015, ISBN - 978-93-511-9-757-7
3	Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss "Hadoop for Dummies", John Wiley & Sons, Inc., 2014 ISBN: 978-1-118-60755-8 (pbk); ISBN 978-1-118-65220-6 (ebk); ISBN 978-1-118-70503-2 (ebk)
4	Nathan Marz and James Warren ,"Big Data Principles and best practices of scalable realtime data systems",April 2015 , ISBN 9781617290343

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**H**	**M**	**M**	**L**	**-**	**L**	**L**	**-**	**-**	**-**	**-**
CO2	**H**	**M**	**L**	**M**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**H**	**H**	**L**	**M**	**M**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**H**	**M**	**L**	**M**	**L**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	M
CO2	H	M
CO3	M	M
CO4	H	M

H –High, M-Medium, L-Low

V Semester

Elective V
Cloud Computing
(Theory and Practice)

Course Code	**:**	**16MCA521**	**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P:S 4:0:2:0**	**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. Familiarize the basic concepts of Infrastructure, Platform and Software services
2. Understand the working of various applications , models and frameworks
3. Exploring the virtualization concepts in the various cloud resource
4. Exploring the various security and security risks in the cloud environment

Unit – I	**10Hrs**

Introduction to Cloud Computing: Defining Cloud Computing, Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift Benefits of cloud computing, Disadvantages of cloud computing, Assessing the Role of Open Standards, Assessing the Value Proposition, Measuring the Cloud's Value, Early adopters and new applications, The laws of cloudonomics, Cloud computing obstacles, Behavioral factors relating to cloud adoption, Measuring cloud computing costs, Avoiding Capital Expenditures, Right-sizing Computing the Total Cost of Ownership, Specifying Service Level Agreements, Defining Licensing Models

Unit – II	**10 Hrs**

Cloud Infrastructure- Cloud Computing at Amazon, Cloud Computing: the Google Perspective, Microsoft Window Azure and Online Services, Open-Source Software Platform for Private Clouds, Cloud Storage Diversity and Vendor Lock-in, Cloud Computing Interoperability: The Intercloud, Energy Use and Ecological Impact of large-Scale Data Center, Service- and Compliance-Level Agreements, Responsibility Sharing Between User and Cloud Service Provider

Unit – III	**08 Hrs**

Cloud Computing: Applications and Paradigms- Challenges for cloud computing, Existing cloud applications and new application opportunities, Architectural styles for cloud applications, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The ZooKeeper, The MapReduce programming model, A case study: The *GrepTheWeb* application

Unit – IV	**10 Hrs**

Cloud Resource Virtualization- Virtualization, Layering and Virtualization, Virtual Machine Monitors, Virtual Machines, Performance and Security Isolation, Full Virtualization and Para Virtualization, Hardware Support for Virtualization, Case Study: Xen, a VMM Based on Para virtualization, Optimization of Network Virtualization in Xen2.0, vBlades: Para virtualization Targeting an x86-64 Itanium Processor, A Performance Comparison of Virtual Machines, The Darker Side of Virtualization

Unit – V	10 Hrs

Cloud Security- Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, Xoar : Breaking the monolithic design of the TCB, A trusted virtual machine monitor

Unit – VI (Lab Component)

Part – A

1) Deploy an image into cloud using manual and command prompt method.
2) Launch multiple instances using manual and command prompt method.
3) Deploy the virtual drive in individual Virtual Machine for storage purpose.
4) Create multiple Virtual Machines to communicate through SSH.
5) Create a new user and grant the privilege to assign project in the cloud environment.

Part – B

1) Demonstrate Live Migration of Virtual Machine in Cloud.
2) Analyze the status of VMs during down time in Live Migration.
3) Create a new instance and associate the instance with floating IP address.
4) Deploy the network with Virtual Local Area Network in cloud.
5) Create a multiple router to communicate with each other by deploying in two different networks.

Note: Students can use any open source tools like Openstack, CloudSim to execute the programs

Expected Course Outcomes

After going through this course the student will be able to

CO1: Understand the fundamental concepts of cloud computing environment
CO2: Identify the various key enabling technologies for cloud computing
CO3: Apply multiple cloud application to the various programming models
CO4: Compare the different cloud platforms to the cloud computing scenarios

Reference Books

1.	Barrie. Sosinsky , " Cloud Computing" WILEY Publishing, Inc. , 2011, ISBN: 978-0-470-90356-8
2.	DAN C. MARINESCU, " CLOUD COMPUTING THEORY AND PRACTICE" , Morgan Kaufmann Publication, 2016, ISBN: 978-93-5107-094-8

Mapping of Course Outcomes (CO) to Program Outcomes (PO)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**
CO1	H	L	--	L	--	--	M	--	M	M	L	M
CO2	L	M	M	--	--	--	H	L	--	L	--	M
CO3	M	L	--	M	--	--	L	M	M	--	L	L
CO4	M	H	L	--	--	--=	M	L	L	L	M	--

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)		
	PSO1	**PSO2**
CO1	H	M
CO2	M	-
CO3	L	H
CO4	-	L
H –High, M-Medium, L-Low		

V Semester

Elective V Virtual Reality (Theory and Practice)					
Course Code	**:**	**16MCA522**	**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P:S 4:0:2:0**	**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives (CLO)

Graduates shall be able to

1. Explain the concepts and principles of Virtual Reality
2. Demonstrate the use of virtual Reality in real World
3. Explore the Fundamental issues of Virtual Reality

Unit – I	**8 Hours**

Introduction: What is Virtual Reality, Virtual Reality Applications

Virtual Reality Hardware: Oculus Rift, Other High End Head Mounted Displays, Gear VR, Google Cardboard, VR Input Devices

Developing for Oculus Rift on the Desktop: 3D Graphic Basics, 3D coordinate systems, Meshes, polygons and vertices, materials, textures, lights, transforms and matrices, cameras, perspective, viewport and projections.

Objects and Scale: Getting started with Unity- Starting a new Unity project, The Unity editor, The default world space. Creating a simple diorama- Adding a cube, Adding a plane, Adding a sphere and some material, Changing the scene view, Adding a photo, Coloring the ground plane.

Unit – II	**10 Hours**

Objects and Scale: Measurement Tools- Keeping a unit cube handy, Using a Grid Projector, Measuring the Ethan character. Importing from the Blender Experiment: An introduction to Blender- A unit cube, A UV Texture image, Importing into Unity. VR device integration software- Unity's built-in VR support, The device-specific SDK, The OSVR project, Web VR, 3D worlds. Creating the MeMyselfEye Prefab.

Physics and the Environment: Unity physics, Bouncy balls, Headshots, Trampoline and brick A human trampoline - Like a brick, Like a character.

Unit – III	**8 Hours**

Interlude – environment and things: Wispy Sky, The planet Earth, The corporate logo, Blender, Unity, An Elevator, Jumping.

Gaze-based Control: Ethan, the walker- Artificially intelligent Ethan, The Navmesh bakery, A random walker in the town, Interlude – a quick introduction to Unity programming, The Random Position script, "Zombie-ize" Ethan. Go where I'm looking- The Look Move To script, Adding a feedback cursor, Observations. If looks could kill- The Kill Target script, Adding particle effects, Cleaning up.

Unit – IV	**12 Hours**

World Space UI: A reusable default canvas, The visor HUD, The reticle cursor, The windshield HUD, The game element UI, The info bubble. An in-game dashboard with input events- Creating a dashboard with buttons, Linking the water hose to the buttons, Activating buttons from the script, Look to highlight a button, Looking and then clicking to select, Looking and staring to select

First-person Character: Understanding the Unity characters - The Camera component, The Rigid body component, The Character Controller component.

Unit – V	**10 Hours**

Unity Standard Assets- Third Person Controller, AI Third Person Controller, First Person Controller, Rigid Body FPS Controller. Making a first person- Move in the direction you're looking, Keep your feet on the ground, Don't pass through solid objects, Don't fall off the edge of the world, Stepping over small objects and handling uneven terrain, Start and stop moving.
User calibrations- A character's height, Real-life height of a player, Re-centering.
Maintaining a sense of self- Head-body disconnect, Head and body And feet, The body avatar, Virtual David le nose, Audio cues, Locomotion, teleportation and sensors, Managing VR motion sickness

Unit – VI (Lab Component)

Part – A

1. Create a 3D object and Apply different geometric Transformations using Mouse/Keyboard
2. Create animation for a 3D object(transformation, color,texture,ect)
3. Bouncing ball on multiple 3D platforms
4. Develop First Person Controller to a Scene
5. Create a 3D Character movement
6. Create a menu driven interface for adding and removing objects from a Scene
7. Build a cubic room, whose sides are made out of six planes. The room should be 15x15x15 Unity units. At the center of the roof of the room, place a point source of light. This light should change color by pressing the Tab key.
8. Finding target using 2D Raycaster
9. Create a loading bar (health bar, progress bar, start bar)
10. Create and show motion effect using time scale and scripts for 2D images.

Part – B

1. Design and Development of Simple VR Game
   a. Action Games
   b. Racing
2. Design and Development of Story Telling
   a. Moral Stories
   b. Fiction Stories
3. Design and Development of Virtual Tour
   a. Forest/Zoo

b. Solar System

4. Design and Development of Medical Application
   a. Animate different Organs
   b. Influence of viruses on human body
5. Design and Development of Building Structure

Note:
Students should complete all programs of Part – A and any one program from Part –B using Unity tool.
In the examination each student will pick one question from Part –A for execution and demonstrate one program from Part –B

Expected Course Outcomes

After going through this course the student will be able to:
CO1 : Understand the concepts of Virtual Reality and its Applications
CO2: Discuss the Principles of Virtual Reality
CO3: Demonstrate a virtual environment to captivate its experiences
CO4: Analyze the fundamental issues of virtual reality

Reference Books:

1	"Learning Virtual Reality, Developing Immersive Experiences and Applications for Desktop, Web and Mobile", Tony Parisi, first edition, 2015, O'Reilly Media, Inc., ISBN-13: 978-93-5213-257-7
2	" Unity Virtual Reality Projects", Jonathan Linowes, first edition, 2015, Packt Publishing Ltd., ISBN 978-1-78398-855-6

Mapping of Course Outcome to Program Outcome

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	H	L	L	L	M	L	-	-	-	-	-	-
CO2	H	M	M	L	M	-	-	-	L	-	L	-
CO3	-	-	H	L	H	-	-	M	M	-	L	-
CO4	-	L	L	H	L	-	-	-	L	-	-	-

Mapping of Course Outcome to Program Specific Outcome

	PSO1	PSO2
CO1	L	L
CO2	L	L
CO3	H	H
CO4	M	H

H –High, M-Medium, L-Low

V Semester

Elective V
Internet of Things
(Theory and Practice)

Course Code	**:**	**16MCA523**	**CIE Marks**	**:**	**100+50**
Hrs/Week	**:**	**L:T:P:S 4:0:2:0**	**SEE Marks**	**:**	**100+50**
Credits	**:**	**5**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. Learn the basics of Internet of Things and its applications
2. Understand IoT principles, design and abstraction of developing IoT systems
3. Work with various sensors and actuators
4. Setup IoT connectivity using dashboards

Unit – I	**8Hrs**

Introduction to Internet of Things:

Fundamentals of Electronics and sensors for Internet of Things. Internet of Things Applications and Use cases, Network and Communication, Standards related to Internet of Things, Protocols in Internet of things

Unit – II	**10 Hrs**

Programming with Arduino : Understanding the eco system of arduino, Pinout configuration, Digital input and output, Analog input and output, working with sensors and actuators. Arduino serial communication. Communication interfaces (SPI and I2C) wired and wireless communication with arduino and sensor data logging from arduino.

Unit – III	**10 Hrs**

Programming with Raspberry Pi : Understanding the eco system of Raspberry Pi3, Pinout configuration, Digital input and output, working with sensors and actuators. Raspberry Pi serial communication. Communication interfaces (SPI and I2C) wired and wireless communication with raspberry Pi. Serial communication from raspberry Pi to arduino

Unit – IV	**10 Hrs**

Programming with esp8266 (nodemcu): Understanding the eco system of esp8266, pinout configuration, Digital, Analog input and output, working with sensors and actuators. Serial communication from raspberry Pi to nodeMCU, Network configuration on esp8266, wired and wireless communication with nodeMCU

Unit – V	**10 Hrs**

IoT Application Development and Integrating sensors with IoT Dashboards

NodeJS / Django Based web application development to monitor and control IoT devices. Integration of Adafruit / Thinksboard and similar tools with sensors and actuators.

Unit – VI (Lab Component)

Implement the following programs using

Part – A

1. Write a program with Arduino UNO board to calculate the distance of a obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain value turn on a buzzer / beeper with a LED in ON state and display the distance in LCD / OLED
2. Write a program with Arduino UNO to indicate the level of temperature using the LEDs indicating the low, medium and high values of temperature (Red, Blue and Green)
or Write a program with Arduino UNO to implement the interactive traffic signal
3. Write a interactive python script on Raspberry Pi3 to implement the serial communication from Raspberry Pi to Arduino and vice versa with the following components
a) LED b) Buzzer c) Temperature and humidity sensor b) four channel relay
4.Write a python script on Raspberry pi to control servo motor and DC Motor based on the potentiometer meter and button switch inputs. Also indicate the angle of the servo motor and change the color of RGB lED / Bulb
5. Write a micro python script with esp8266 based nodemcu board to calculate the distance of a obstacle based on the Ultrasonic sensor inputs. If the distance calculated is less than a certain value turn on a buzzer / beeper with a LED in ON state and display the distance in LCD / OLED
6. Write a micro python script with esp8266 based nodemcu board to operate a 4 channel relay demonstrating minimal home automation

Part – B

7. Integrate online dashboard like Adafruit / gobot / thingsboard to any of the experiments in PART A .

Note : nodemcu with lua and 4 channel relay can be used instead of micropython

8. Integrate Blynk /gobot / Thingsboard dashbaord with arduino or Raspberry pi or nodemcu and proximity and ultrasonic sensor
9 . Develop a django dashboard to monitor and control the sensor and actuators used in PART A
10. Develop a javascript based application to monitor power and water consumption with billing.

Expected Course Outcomes

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

CO1: Understand the architecture of Arduino, Raspberry Pi, nodeMCU, arduino IDE, frameworks
CO2: Differentiate between various development boards, sensors and actutators, install NOOBS Ubuntu IoT Operating System and setup Raspberry PI, Arduino and nodeMCU
CO3: Interacting with arduino,raspberry pi and nodeMCU using python, JavaScript,
CO4: Learn and Implement various IoT solutions practically

Reference Books

NOTE: Since there is no one text book comprehensively covering all the topics mentioned. Faculty of MCA will be Authoring a text book titled "IoT Application Development" covering the syllabus. The following text books will be referred .

1 .Exploring Arduino: Tools and Techniques for Engineering Wizardry 1st Edition WILEY, ISBN-10: 1118549368, ISBN-13: 978-1118549360
2. Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux 1st Edition Derek Molloy, ISBN-13: 978-1119188681 ,ISBN-10: 1119188687
3. Internet of Things with ESP8266 , Marco Schwartz , 29 Jul 2016, PACKT
4. Internet of Things: A Hands-on Approach by Arshdeep Bahga, Vijay Madisetti, July 1st 2015 by Orient Blackswan Private Ltd ISBN : 8173719543
5.Building the Web of Things , Dominique D. Guinard and Vlad M. Trifa, ISBN 9781617292682

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	L	L	--	L	L	–	M	–	M	M	L	--
CO2	L	M	M	--	L	--	H	L	--	L	--	--
CO3	M	M	M	M	M	–	M	--	–	–	-	-
CO4	M	H	H	M	H	L	M	L	L	L	M	M

Mapping of Course Outcomes(CO) to Program Specific Outcomes(PSO)

	PSO1	PSO2
CO1	-	-
CO2	L	L
CO3	M	M
CO4	H	M

H –High, M-Medium, L-Low

V Semester

Elective VI
Distributed and Parallel Computing

Course Code	**:**	**16MCA531**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives:

1. Gain basic understanding of fundamental concepts of distributed and parallel computing
2. Be able to identify and leverage common distributed and parallel computing patterns
3. Be able to properly assess efficiency and scalability of a distributed and parallel algorithm/application
4. Become proficient in using different programming techniques to implement basic distributed and parallel computing paradigms

10 Hrs

Introduction to Distributed and Parallel Computing

Introduction to Distributed Computing – Introduction ,Definition, Goals of Distributed systems, Issues to Distributed systems , Types of Distributed Systems , Distributed System Models , Models of Middle ware

Introduction to Parallel Computing – Introduction ,Computing , Parallel Architecture , Classification based on architectural scheme , Classification based on Memory access , Performance Metrics ,Parallel Programming models, Serial and Parallel Algorithms, Parallelism

Unit – II **10 Hrs**

Communication and Resource Management (Distributed Computing)

Communication : Introduction , Layered protocols , Remote Procedure Calls , Remote Object Invocation , Remote Method Invocation , Message Oriented Communications , Stream Oriented Communications

Resource Management : Resource management in Distributed system ,Desirable Features of Global Scheduling algorithm **,** Scheduling in Distributed system **,** Load Balancing approach in distributed system , Load Sharing Approach

Unit – III **10 Hrs**

Synchronization , Replication and Distributed File System (Distributed Computing)

Introduction ,Clock Synchronization , Physical clock , Logical clock , Election Algorithms , Mutual Exclusion , Centralised algorithm , Distributed Mutual Exclusion

Replication and Distributed File System

Replication Management ,Distributed File system ,Case studies

Unit – IV **10 Hrs**

Distributed Memory Programming with MPI (Parallel Computing)

Getting Started , Trapezoidal Rule in MPI ,Dealing with I/O, Collective Communication , MPI Derived data types ,Performance Evalution of MPI programs , A parallel sorting algorithm

Unit – V **08 Hrs**

Shared Memory programming with Open MP(Parallel Computing)

Getting Started , Trapezoidal Rule , Scope of Variables , Reduction Clause – Parallel for directive , More about Loops in open , Scheduling loops

Expected Course Outcomes

After going through this course the students will be able to

CO1. Realize the need of distributed and parallel computing systems and techniques

CO2. Summarize the techniques to handle components of distributed and parallel computing

CO3. Apply different management(Communication, Resource,Memory,File) techniques to handle distributed and parallel mechanism

CO4. Evaluate the metrics and performance of the serial, distributed and parallel programs

Reference Books

1	Arun Kulkarni, Nupur Prasad Giri, Nikeshi Joshi, Bhushan Jadhav, "Parallel and Distributed Systems", Second Edition, Wiley Publication, 2017, ISBN: 978-81-265-6582-5
2	Peter S Pacheco , "An Introduction to Parallel Programming", Morgan Kaufmann Publishers – 2014, ISBN : 978-93-80931-75-3
3	Sunita Mahajan and Seema Shah, "Distributed Computing ", Second Edition, Oxford University Press, ISBN-10: 0198093489, ISBN-13: 9780198093480
4	Albert Y. Zomaya, Editor , "Parallel and Distributed Computing Handbook ",McGraw-Hill, ISBN-13: 978-0070730205 , ISBN-10: 0070730202

Mapping of Course Outcome to Program Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	H	L	-	L	-	-	-	L	-
CO2	H	H	M	L	M	-	L	L	-	-	L	-
CO3	M	M	H	H	H	-	L	-	L	-	-	-
CO4	H	H	H	H	H	-	L	-	L	-	L	-

Mapping of Course Outcome to Program Specific Outcome

	PSO1	PSO2
CO1	H	L
CO2	H	M
CO3	M	H
CO4	M	H

H-High, M-Medium, L-Low

V Semester

Elective – VI
Service Oriented Architecture

Course Code	**:**	**16MCA532**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. To identify all fundamental concept of Service-Orientation.
2. To analyze basic Principles of service –Composibility.
3. Use and compare different Service Technology .
4. To apply concurrency and synchronization techniques to develop J2EE and .NET real world applications.

Unit – I	**10 Hrs**

An Overview of SOA & Service-Orientation: Services and Service-Orientation, Service-Orientation, Yesterday and Today, Applying Service-Orientation, The Eight Principles of Service-Orientation

The Four Characteristics of SOA , The Four Common Types of SOA.,SOA Design Patterns

Unit – II	**10 Hrs**

A Look at How Services are Defined and Composed: Basic Concepts, Agnostic and Non-Agnostic Logic, Service Models and Service Layers,Service and Service Capability Candidates, Breaking Down the Business Problem,Functional Decomposition, Service Encapsulation,Agnostic Context,Agnostic Capability ,Utility Abstraction,Entity Abstraction, Non-Agnostic Context,Process Abstraction and Task Services

Unit – III	**10 Hrs**

An Overview of Service Technology:

SOAP-Based Web Services,REST Services,Components, Service Virtualization, Cloud Computing, APIManagement, Model-Driven Software Design, Semantic Web, Business Process Management, Composition and Orchestration, Master Data Management,Business Rule Engines,Social Network Technologies,Mobile Computing,Agent-Driven Architecture, Event-Driven Architecture and Complex Event Processing

Unit – IV	**10 Hrs**

Enterprise Applications: Learning Objectives, Architectural Considerations, Solution Architecture for Enterprise Applications, Solution Architecture for Enterprise Applications based on SOA, Software Platforms for Enterprise Applications.

Unit – V	**08 Hrs**

A Case Study: Systems Landscape , New Marketing Strategy , Corporate Culture, Vehicle ,Maintenance , The Billing System , Strategic Considerations , Cloud Adoption . New Reference Architecture , The Customer Profile Process.

Expected Course Outcomes

After going through this course the students will be able to

CO1: Understand the basic concepts of Service Orientation.

CO2: Analyze the SOA Architectural style, SOA strategies, modeling web services

CO3: Design, implementing process of SOA in web service.

CO4: Apply the SOA operational style for the web services.

Reference Books

1	Thomas Erl: **Next Generation SOA: A Concise Introduction to Service Technology & Service-Orientation ,** Pearson Education, 2014. 1st Edition, ISBN-978-0133859041
2	Shankar Kambhapaty: **Service –Oriented Architecture for Enterprise and Cloud Applications**, Second Edition, Willy India, 2012. ISBN-978-81-265-1989-7

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**M**	**M**	**L**	**L**	**L**	**-**	**L**	**H**	**M**	**-**	**L**	**L**
CO2	**M**	**M**	**H**	**M**	**M**	**-**	**L**	**H**	**M**	**-**	**L**	**M**
CO3	**L**	**H**	**L**	**H**	**M**	**-**	**L**	**L**	**H**	**-**	**M**	**M**
CO4	**M**	**M**	**H**	**M**	**H**	**-**	**L**	**L**	**H**	**-**	**M**	**L**

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	H
CO2	M	L
CO3	M	L
CO4	L	M

H-High, M-Medium, L-Low

V Semester

Elective VI
Data warehousing & Data Mining

Course Code	**:**	**16MCA533**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. Examine the types of the data to be mined and apply pre-processing methods on raw data.
3. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms

Unit – I **10 Hrs**

Introduction to Data Warehouse and OLAP Techniques

Data Ware house Basic Concepts , Data Warehouse Modeling : Data Cube and OLAP ,Data Warehouse : Design and Usage ,Data Warehouse Implementation

Unit – II **12 Hrs**

Introduction to Data Mining

Why Data Mining ,What is Data Mining, What kinds of patterns can be mined, Which Technologies are used, Which kinds of applications are targeted, Major Issues in Data Mining

Getting to Know Your Data and Data Preprocessing

Data Objects and Attribute types, Measuring Data Similarity and Dissimilarity, Data Preprocessing : An Overview ,Data Cleaning, Data Integration, Data Reduction : Overview of Data Reduction Strategies ,Principal Component Analysis, Attribute subset selection, Clustering, Sampling

Unit – III **10 Hrs**

Classification Basic Concepts : Basic Concepts

Decision Tree Induction : Decision tree induction , Attribute Selection Method ,Tree Pruning

Bayes Classification Methods : Bayes Theorem ,Naïve Bayesian Classification

Rule Based Classification Techniques : Using IF-Then Rules for classification, Rule Extraction from a Decision tree ,Rule Induction using sequential covering algorithm

Model Evaluation and Selection : Metrics for evaluating a classifier performance ,Hold Method and Random sampling,Cross Validation, Comparing classifiers based on Cost-Benefit and ROC Curves

Unit – IV **08 Hrs**

Association Mining Basic concepts : Market Basket Analysis, Frequent Item sets , closed Item sets and Association Rules

Frequent Item set Mining Methods : Apriori Algorithm ,Generating Association rule from frequent item sets , Improving the Efficiency of Apriori

Pattern Evaluation Methods : Strong rules are not necessarily Interesting, A comparison of Pattern evaluation methods

Unit – V	08 Hrs

Cluster Analysis :**Basic Concepts and Methods**

Cluster Analysis ,Partitioning Methods ,Hierarchical Methods : Agglomerative v/s Divisive Hierarchical clustering ,Distance measures in Algorithmic methods , Evaluation of Clustering

Expected Course Outcomes

CO1: Understand the components of data warehouse architecture and OLAP operations

CO2: Process raw data to make it suitable for various data mining algorithms

CO3: Apply Clustering, Classification, Rule mining algorithms to find patterns

CO4: Evaluate the different data mining algorithms using various metrics

Reference Books

1	Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining – Concepts and Techniques ", 3rd Edition, Morgan Kauffmann Publications , 2012, ISBN: 978-93-80931-91-3
2	Pang-Ning Tan, Michael Steinbach, Vipin Kumar , "Introduction to Data Mining", Addison Wesley, 2008 , ISBN:978-81-317-1472-0
3	G K Gupta, "Introduction to Data Mining with Case Studies", 2nd Edition , PHI Learning Private Ltd, ISBN 978-81-203-4326-9

Mapping of Course Outcome to Program Outcome

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	H	M	M	-	L	-	-	-	L	-
CO2	L	M	M	M	H	-	L	-	-	-	M	-
CO3	M	H	H	H	H	-	M	L	L	-	L	-
CO4	H	M	M	H	H	_	L	-	-	-	-	-

Mapping of Course Outcome to Program Specific Outcome

	PSO1	PSO2
CO1	M	L
CO2	M	L
CO3	H	M
CO4	L	L

H-High, M-Medium, L-Low

V Semester

Elective VII
Wireless and Mobile Networks

Course Code	**:**	**16MCA541**	**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**4:0:0:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**4**	**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. Explore the design issues in wireless networks.
2. Gain an overview of wireless and mobile network and its applications in communication engineering
3. Understand the various principles, concepts and design of wireless mobile communications.
4. Analyse the architecture and protocols of wireless mobile networks

Unit – I	**8 Hrs**

Fundamentals of Wireless Communication: Digital Communications, Wireless Communication System, Wireless Media, Frequency Spectrum, Technologies in Digital Wireless Communication, Wireless Communications Channel Specifications, Types of Wireless Communication Systems

Unit – II	**10 Hrs**

Basics of Wireless Networks: Wireless Networks, Wireless Switching Technology, Wireless Network Reference Model.

Cellular Mobile Wireless Networks: System Design Fundamentals and Propagation Path Loss Models- Description of Cellular Systems, Propagation Models for Wireless Networks- Free-space Propagation Model and Two-Ray Ground Reflection Model. Mobile Communication Antennas

Unit – III	**10 Hrs**

Second-Generation Mobile Networks-GSM: Architecture and Protocols – GSM Network Architecture, GSM Multiple Access Scheme, GSM Protocols and Signaling Authentication and Security.

3G-The Universal Mobile Telecommunication System (UMTS): UMTS Network Architecture-Release, UMTS Interfaces, UMTS Networks Evolution, UMTS FDD and TDD, UMTS Channels, UMTS Network Protocol Architecture

Unit – IV	**10 Hrs**

Fundamentals of Wireless Local Area Networks: IEEE 802.11, WLAN Transmission Technology, WLAN System Architecture, Collision Sense Multiple Access with Collision Detection: CSMA/CD, Collision Sense Multiple Access with Collision Avoidance: CSMA/CA

Future Trends: Fourth Generation (4G) system and Beyond: Introduction, Design Goals for 4G and Beyond and related Issues – Orthogonal Frequency Division Multiplexing (OFDM), 4G Services and Applications, Challenges- Predicting the future of wireless Systems

Unit – V	10 Hrs
Security Issues in Wireless in Wireless System: The Need for Wireless Security, attacks on Wireless networks, Wired Equivalent Privacy (WEP) Protocol **Drivers for 5G: The 'Pervasive Connected World' :** 5G Roadmap, 10 Pillars of 5G, **The 5G Internet:** Introduction, Internet of Things and Context-Awareness, Networking Reconfiguration and Virtualisation Support, Mobility, Quality of Service Control	

Expected Course Outcomes

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

CO1: Understand the basic concepts and standards related to wireless mobile networks.

CO2: Explore various concepts and principles used in wireless network

CO3: Build knowledge upon architecture and protocols of wireless mobile networks

CO4: Analyze the design issues in wireless and mobile networks

Reference Books:

1	Dr. SunilKumar S. Manvi, Mahabaleshwar S.kakkasageri, "Wireless and Mobile Networks: Concepts and Protocol", Wiley India, ISBN: 978-81-265-2069-5, Reprint 2012
2	Iti Saha Misra. *Wireless Communications and Networks: 3G and Beyond*. McGraw Hill Education (India) Pvt Ltd, ISBN – 13:978-0-07-015140-6, 2013.
3	Georgios I. Papadimitriou, Andreas S. Pomportsis, P. Nicopolitidis, Mohammed S. Obaidat "Wireless Networks", Publisher-John Wiley & Sons, ISBN- 0470858028, 2003
4	Rodriguez, Jonathan, ed. Fundamentals of 5G mobile networks. Publisher- John Wiley & Sons, ISBN: 9781118867525, 2015

Mapping of COs with POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	-	L	M	-	L	M	L	-	-	M	-	-
CO2	L	L	-	H	H	L	-	-	-	M	-	-
CO3	-	M	M	H	M	H	H	-	-	M	-	-
CO4	L	L	H	H	H	M	L	-	-	M	-	-

Mapping of Course Outcome to Program Specific Outcome

CO\PSO	PSO1	PSO2
CO1	M	H
CO2	M	M
CO3	L	H
CO4	L	M

H –High, M-Medium, L-Low

V Semester

Elective VII
Principles of UI / UX Design

Course Code	**:**	**16MCA542**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

1. Graduates shall be able to
2. Understand the basics of user interface and user experience design
3. Develop various design skills in UI and UX
4. Determine quality of service in UI design strategies/ user experience process and technical documentation
5. Establish individual and collaborative skills in design-based problem solving

Unit – I **10 Hrs**

Introduction to User Interface Design Process

Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Guideline, principles, and theories, **Managing Design Processes:** Introduction, Organizational Design to support Usability, The Four Pillars of Design, Development methodologies, Ethnographic Observation, Participatory Design, Scenario Development

Unit – II **10 Hrs**

Evaluating Interface Design and Interacting Styles

Evaluating Interface Design: Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments. **Direct Manipulation and Virtual Environments:** Introduction, 3D Interfaces, **Menu Selection, Form Filling and Dialog Boxes:** Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

Unit – III **10 Hrs**

Quality of Service and Information Search

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, **Balancing Function and Fashion:** Introduction, Error Messages, Non-anthropomorphic Design, Display design, Window Design, Colour. **Information Search:** Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, advanced filtering and Search Interfaces

Unit – IV **08 Hrs**

User Experience Design

Introducing User Experience, From product design to user experience design, Designing for experience, User experience and the web, Building from bottom to top, Elements of user experience

Unit – V	10 Hrs

Strategy Plane and Surface Plane

Strategy Plane : Product Objectives,Business goals,Brand Identity ,Success Metrics and User Needs, User Segmentation, Usability and User Research, Creating Personas

Surface Plane: Sensory Design, Defining the Surface, Making Sense of the Senses, Contrast and Uniformity, Internal and External Consistency, Color Palettes and Typography, Design Comps and Style Guides.

Case Study: To explore the UI/UX using Wire framing /Prototyping tools

Expected Course Outcomes

After going through this course the student will be able to

CO1: Understand the theoretical foundations and awareness of User Interface and User Experience design

CO2: Identify and Apply various Design Skills in UI and UX for real world Applications

CO3: Demonstrate Quality of Service in UI Design strategies/ Approaches and Technical documentation Process

CO4: Evaluate UI/UX design Process/ artifacts for building products

Reference Books

1	Ben Shneiderman, Plaisant, Cohen, Jacobs, "Designing the User Interface", Pearson Education, 2014, 5th Edition, ISBN-10: 9332518734 ISBN-13: 978-9332518735
2	Jesse James, "The Elements of User Experience: User-Centred Design for the Web", New Riders Publishers ,2nd Edition, 2011, ISBN-10: 0321683684 ISBN-13: 978-0321683687
3	Bill Buxton , "Sketching User Experiences: Getting the Design Right and the Right Design" , Morgan Kaufmann,2007, ISBN-10: 0123740371 ISBN-13: 978-0123740373
4	Jeffrey Rubin, Dana Chisnell, "Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests" , Wiley India Private Limited, 2nd edition,2008 ISBN-10: 8126516909 ISBN-13: 978-8126516902

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	L	M	M	-	L	-	L	L	L	-
CO2	M	M	M	L	L	-	M	-	M	L	M	-
CO3	M	L	M	L	L	-	L	-	M	-	M	-
CO4	M	M	M	M	M	-	M	-	M	-	M	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	H
CO2	M	H
CO3	L	M
CO4	M	M

H –High, M-Medium, L-Low

V Semester

Elective VII
Soft Computing

Course Code	**:**	**16MCA543**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S 4:0:0:0**		**SEE Marks**	**:**	**100**
Credits	**:**	**4**		**SEE Duration**	**:**	**3 Hrs**

Course Learning Objectives (CLO)

Graduates shall be able to

1. Understand the learning algorithms using neural networks.
2. Differentiate between Classical Sets and Fuzzy Sets
3. Apply fuzzy logic to solve real world problems.
4. Apply genetic algorithm to solve optimization problems

Unit – I **10 Hrs**

Artificial Neural Network

Fundamental Concept – Artificial Neural Network, Biological Neural Network, Brain Vs Computer; Important Terminologies of ANNs – Weights, Bias, Threshold, Learning rate, Momentum Factor, Vigilance Parameter, Notations; Back Propagation Network- Theory, Architecture, Flow chart for Training Process, Training Algorithm, Learning Factors of Back Propagation Network, Testing Algorithm of Back Propagation Network, Radial Basis Function Network, Time Delay Neural Network

Unit – II **10 Hrs**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets

Introduction to Fuzzy Logic, Classical Sets – Operators on classical sets, Fuzzy Sets- Fuzzy Set Operations, properties of Fuzzy Sets

Classical Relations and Fuzzy Relations

Introduction, Cartesian Product of Relation, Classical Relation – Cardinality of Classical Relation, Operations on Classical Relations, Properties of Crisp Relations, Composition of Classical Relations; Fuzzy Relations - Cardinality of Fuzzy Relation, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Composition

Unit – III **10 Hrs**

Member Functions

Introduction, Features of the Membership Functions, Fuzzification, Methods of Membership Value Assignments – Intuition, Inference, Rank Ordering, Angular Fuzzy Sets, Neural Networks, Genetic Algorithms, Induction Reasoning

Unit – IV **08 Hrs**

Defuzzification

Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods – Max-Membership Principle, Centroid Method, Weighted Average Method, Mean-Max Membership, Centre of Sums, Centre of Largest Area, First of maxima

Unit – V **10 Hrs**

Genetic Algorithms

Biological Background – The Cell, Chromosomes, Genetics, Reproduction, Natural Selection; Traditional Optimization and Search Techniques – Gradient-Based Local Optimization Method,

Random Search, Stochastic Hill Climbing, Simulated Annealing, Symbolic Artificial Intelligence; Genetic Algorithm and Search Space – Search Space, Genetic Algorithms World, Evolution and Optimization, Evolution and Genetic Algorithms, Basic Terminologies in Genetic Algorithm – Individuals, Genes, Fitness, Populations; Operators in Genetic Algorithm – Encoding, Selection, Crossover, Mutation; Stopping Condition for Genetic Algorithm Flow – Basic Individual, Worst Individual, Sum of Fitness, Median Fitness

Expected Course Outcomes

After going through this course the student will be able to

CO1: Understand the fundamentals of Soft computing approaches and demonstrate the basic functionalities

CO2: Apply the soft computing techniques to solve problems

CO3: Analyze the results of soft computing techniques to handle various problems

CO4: Evaluate the solutions of soft computing algorithms for optimization

Reference Books

1	S. N. Sivanandam, S. N. Deepa, "Soft Computing', Wiley Publishers, 2nd Edition, 2015, ISBN – 978-81-265-2741-0
2	B. K. Tripathy, J. Anuradha " Soft Computing Advances and Applications", 2015, Cengage Learning India Pvt Ltd, ISBN-13: 978-81-315-2619-4, ISBN-10: 81-315-2619-4
3	Earl Gose, Richard JohnsonBaugh, Steve Jost, "Pattern Recognition and Image Analysis", Pearson, 2015, ISBN: 978-93-325-4979-1
4	James A. Anderson, "An Introduction to Neural Networks", Prentice Hall of India,ISBN-81-203-1351-8

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	M	L	-	L	L	-	-	-	-
CO2	H	M	L	M	M	-	-	-	-	-	-	-
CO3	H	H	L	M	M	-	-	-	-	-	-	-
CO4	H	M	L	M	L	-	-	-	-	-	-	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	M
CO2	H	M
CO3	M	M
CO4	H	M

H –High, M-Medium, L-Low

V Semester

MINOR PROJECT – II						
Course Code	**:**	**16MCA55**		**CIE Marks**	**:**	**100**
Hrs/Week	**:**	**L:T:P:S**	**0:0:10:0**	**SEE Marks**	**:**	**100**
Credits	**:**	**05**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives (CLO):

Students are able to

1. Understand the method of applying computational knowledge to solve specific problems
2. Apply software engineering and management principles while executing the project
3. Demonstrate the skills for good presentation and technical report writing skills
4. Identify and solve complex computing problems using professionally prescribed standards

GUIDELINES

1. Each project group will consist of maximum of two students
   The Student shall undertake minor project- II depending on the electives studied in the previous semesters / Research based / Industry Oriented
   Each student / group has to select a contemporary topic that will use the technical knowledge of their program of study after intensive literature survey
2. Allocation of the guides preferably in accordance with the expertise of the faculty
3. The number of projects that a faculty can guide would be limited to six
4. The minor project would be performed in-house

The implementation of the project must be preferably carried out using the resources available in the Department/college

Course Outcomes

After going through this course the students will be able to

CO1: Conceptualize, design and implement solutions for specific problems
CO2: Apply project and resource managements skills considering the societal concerns
CO3: Exhibit the solutions through presentations and technical reports
CO4: Synthesize self-learning, Team Work and ethics

Scheme of Continuous Internal Examination (CIE)

Evaluation of the project work will be done by the committee appointed by the Director, Dept of MCA. The student should submit report on the mini project work.

Evaluation will be carried out in THREE Phases.

Phase	Activity	Weightage
I	Synopsis submission, Preliminary seminar for the approval of selected topic and Objectives formulation	10%
II	Mid-term seminar to review the progress of the work and documentation • Design and simulation / algorithm development / experimental setup • Conducting experiments / implementation / testing	 25% 25%
III	Oral presentation Demonstration Project report	10% 20% 10%

Scheme for Semester End Examination (SEE)

The evaluation will be done by Internal and External examiners. The following weightage would be given for the examination. Evaluation will be done in batches of 10 students.

1. Brief write-up about the project 05%
2. Presentation / Demonstration of the project 20%
3. Methodology and Experimental Results & Discussion 25%
4. Report 20%
5. Viva Voce 30%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	H	M	-	-	M	-	H	M	L
CO2	-	-	-	-	M	M	-	H	M	H	-	-
CO3	M	M	H	-	M	-	-	-	M	-	M	-
CO4	-	M	-	-	-	H	M	-	M	-	H	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	M
CO2	L	L
CO3	-	M
CO4	M	M

H-High, M-Medium, L-Low

VI Semester

MAJOR PROJECT						
Course Code	**:**	**16MCA61**		**CIE Marks**	**:**	**150**
Hrs/Week	**:**	**L:T:P:S**	**0:0:46:0**	**SEE Marks**	**:**	**150**
Credits	**:**	**23**		**SEE Duration**	**:**	**3 Hours**

Course Learning Objectives:

The students shall be able to

1. Understand the method of applying technical knowledge to solve specific problems.
2. Apply software engineering and management principles while executing the project
3. Demonstrate good verbal presentation and technical report writing skills
4. Identify and solve complex application / research oriented problems using professionally prescribed standards

GUIDELINES

1. Major project will have to be done by only one student in his / her area of interest
2. Each student has to select a contemporary topic in the area of application or research that will use the technical knowledge and skill set
3. The project can be carried out on-campus or in an industry or an organization with prior approval from the Director, Department of MCA
4. The candidate must maintain and submit weekly project work diary duly signed by the internal and external guide to verify the regularity of the student
5. Internal Evaluation of the project work will be done by the evaluation committee appointed by the Director, Department of MCA.
6. The standard duration of the project is for 5 month duration, however if the evaluation committee of the department, after the assessment feel that the work is insufficient and it has to be extended, then the student will have to continue as per the directions of the committee.
7. Students are mandatorily required to publish in reputed journals/ conferences.

Course Outcomes:

After going through this course the students will be able to

CO1: Conceptualize, design and implement solutions for specific problem defined
CO2: Communicate the solutions through presentations and dissertation report
CO3: Apply project and resource managements skills, professional ethics, societal concerns
CO4: Exhibit self-learning, lifelong learning skills towards sustainable solutions

Scheme of Continuous Internal Examination (CIE)

Evaluation will be carried out in THREE Phases. The evaluation committee will comprise of: guide and members appointed by Director, MCA.

CIE Phase wise Evaluation of Activities for Major Project

Phase	Activity	Marks
I 5th week	Synopsis submission, Preliminary seminar for the approval of selected topic and objectives formulation	10

II 10th week	Mid-term seminars to review the progress of the work and documentation – • SRS and algorithm development • Design and simulation/ experimental set up	 40 40
III 15th week	Conducting experiments / implementation / testing Demonstration Dissertation Report	20 20 20

In CIE, candidate must score 50% to take up SEE.

Scheme for Semester End Evaluation (SEE):
The evaluation will be done by ONE Senior faculty / Internal Guide from the department and ONE External member from Academia / Industry / Research Organization. The following weightages would be given for the examination. Evaluation will be done in batches, not exceeding SIX students.

Evaluation will be done individually and marks distribution is as below

a. Relevance of the project - 25
b. Project Standard with respect to the post-graduation / Research/application oriented- 50
c. Final Testing and Results with conclusion - 25
d. Viva-voce - 50

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	L	M	L	-	-	-	L	L
CO2	-	-	-	-		M	-	M	H	-	-	-
CO3	-	-	-	-	L	M	M		-	H	L	-
CO4	-	-	-	-	L	M	H	M	-	-	H	L

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	H	H
CO2	L	L
CO3	M	L
CO4	H	H

VI Semester

SEMINAR						
Course Code	**:**	**16MCA62**		**CIE Marks**	**:**	**50**
Hrs/Week	**:**	**L:T:P:S**	**0:0:4:0**	**SEE Marks**	**:**	**00**
Credits	**:**	**2**		**SEE Duration**		**--**

Course Learning Objectives (CLO):

The students shall be able to:

1. Understand the technological developments in the chosen field of interest
2. Explain the scope of work and challenges in the domain area
3. Analyze technological developments in the context of societal concerns, project management and sustainability
4. Demonstrate presentation and report writing skills

GUIDELINES

1. The seminar presentation shall be done by individual students.
2. The topic for seminar should be in one of the thrust areas relevant to industry or on-going research with in-depth technical review and analysis
3. The topic can also be an extension of the Major project
4. The student must be able to highlight or relate the technological developments with societal relevance and sustainability
5. The students must mandatorily address professional computing practices relevant to the topic of study
6. The student shall make an attempt to perform financial / cost analysis or apply project management tools as related to his/her topic of study
7. Each student must submit both hard and soft copy of the presentation and report

Course Outcomes:

After going through this course the student will be able to:

CO1: Identify topics in recent trends in computing technology

CO2: Perform literature / market / product survey and analyze information in the field of study

CO3: Exhibit creative thinking abilities

CO4: Demonstrate presentation and report writing skills

Scheme of Continuous Internal Evaluation (CIE): Evaluation would be carried out in TWO phases. The evaluation committee shall comprise of TWO senior faculty members. The evaluation criteria shall be as per the rubrics given below:

Rubrics for Evaluation:

- Topic – Technical Relevance, Sustainability and Societal Concerns 15%
- Literature Review 25%
- Presentation Skills 35%
- Report 25%

Mapping of Course Outcomes (CO) to Program Outcomes (PO)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	M	M	M	M	H	H	-	-	L	M	-
CO2	L	M	-	-	-	-	-	-	-	H	-	-
CO3	-	L	M	-	H	L	L	-	-	-	M	-
CO4	-	-	-	-	-	L	L	M	H	-	-	-

Mapping of Course Outcomes (CO) to Program Specific Outcomes (PSO)

	PSO1	PSO2
CO1	M	L
CO2	L	L
CO3	L	L
CO4	L	L