MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI – 12

M.C.A

Syllabus

FROM THE ACADEMIC YEAR 2023 – 2024

1. Preamble

The Department of Computer Science was established with the objective of imparting quality education in the domain of Computer Science and Applications. With rapidly evolving technology and the continuous need for innovation, the department has always produced quality professionals, holding important positions in Information Technology industries in India and abroad. The Department updates its syllabi frequently to attract young talents from all over the country. The academic activities of the department, during the last four years, were centered on teaching and research programmes in computer science with a view to train post-graduates and researchers who can contribute significantly to the requirements of professional organizations in the field.

2. General Graduate Attributes (MCA)

G.A.1 Core Knowledge Enrichment

Train the students with Deep Core subject knowledge(including the fundamental concepts, computational models, advanced core techniques, appropriate Domain expertise).

Apply the knowledge of deep core concepts to conceptualize the computational models.

Accredited or validated against national or international standards.

G.A.2 Critical Analysis and Decision Making

Skilled with strategic thinking, problem solving, making better use of intuition, learning to evaluate better, and recognizing the essence of things

Analyze the complex problems and to evaluate and assess information in a practical and technical way and ends up with the specialized computational models to provide valid decisions.

G.A.3 Real-Time Project Design and development

Investigating the real world problems to design and develop the computational framework to cope with real world expectations; to fit that model to the complex real-time data and to apply appropriate research methods to synthesis the information to make appropriate decisions

G.A.4. Project Management Capabilities

Trained to apply effective management skills to produce specific project outcomes

G.A.5. Tools usage

Capable to learn and apply recent domain specific knowledge in the computer science and applications industry

G.A.6. Leadership and Teamwork

Skilled to work effectively as a member and also as a leader in multi- disciplinary

teams.

G.A.7. Communication Skills

Trained to communicate the technical aspects with computing professionals and with society at large. Such ability includes listening, reading, speaking and writing, and the ability to comprehend and effective technical report writing and document preparation.

G.A.8. Professionalism

Trained to think and act professionally to adapt themselves in their work places and society to showcase their talents and skills smartly for their self up liftmen...Aware about the cyber regulations and professional ethics, responsibilities and norms of professional computing practice.

G.A.9.Advanced Technology Awareness

Trained to update themselves periodically with the current/ modern technologies and enrich their knowledge through various online MOOC Courses to cope with the current industrial requirements.

G.A.10. Life Long Learning

To inculcate the passion for continuum learning for a successful professional career

G.A.11. Social Welfare with Ethical Values

Adapt at operating in other cultures, comfortable with different nationalities and social contexts, able to determine and contribute to desirable social outcomes.

Avoiding unethical behavior such as fabrication, falsification of data, committing plagiarism.

G.A.12. Entrepreneurship

Identify the timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and the society at large.

3. Programme Specific Qualification Attributes

PSQA-GA Mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
K1(Knowledge)	■								■	■		■
K2 (Understanding)	■	■								■		■
K3 (Application level)	■		■	■	■					■	■	■
K4 (Analytical level)		■	■	■	■	■			■	■		■
K5 (Evaluation capability level)		■	■	■	■			■	■	■		■
K6 (Scientific or Synthesis level)	■	■	■	■					■	■	■	■

4. Vision

Achieving excellence in Information Technology Enabled Services through Teaching, Research, Extension and Consultancy.

Mission

To offer accredited post graduate and research programmes with the state-of-art technology throughout the Nation to maintain high academic standards and teaching quality

To be a center of excellence for research and innovation in frontier areas of Computer Science and technology relevant to the country.

5. Programme Objectives and Outcomes

Programme Educational Objectives

P.E.O.1. Sound background in fundamental core concepts and Computational principles, which are applied for complex problems Solving

P.E.O.2. Developing the professional skills and entrepreneur skills with Team work, leadership and communication qualities

P.E.O.3. Practicing lifelong learning for successful professional career with Ethical values

Programme Outcomes (POs) for Master of Computer Applications

P.O.1. Train the students with Deep Core subject knowledge (including the fundamental concepts, computational models, advanced core techniques, appropriate Domain expertise). Apply the knowledge of deep core concepts to conceptualize the computational models. Accredited or validated against national or international standards.

P.O.2. Skilled with strategic thinking, problem solving, making better use of in tuition, learning to evaluate better, and recognizing the essence of things. Analyze the complex problems and to evaluate and assess information in a practical and technical way and ends up with the specialized computational models to provide valid decisions.

P.O.3. Investigating the real world problems to design and develop the computational framework to cope with real world expectations; to fit that model to the complex real-time data and to apply appropriate research methods to synthesis the information to make appropriate decisions

P.O.4. Trained to apply effective management skills to produce specific project outcomes

P.O.5. Capable to learn and apply recent domain specific knowledge in the computer science and applications industry

P.O.6. Skilled to work effectively as a member and also as a leader in multi- disciplinary teams.

P.O.7. Trained to communicate the technical aspects with computing professionals and with society at large. Such ability includes listening reading, speaking and writing, and the

ability to comprehend and effective technical report writing and document preparation.

P.O.8. Trained to think and act professionally to adapt themselves in their work places and society to show case their talents and skills smartly for their self upliftment. Aware about the cyber regulations and professional ethics, responsibilities and norms of professional computing practice.

P.O.9. Trained to update themselves periodically with the current/modern technologies and enrich their knowledge through various online MOOC Courses to cope with the current industrial requirements.

P.O.10. To inculcate the passion for continuum learning for a successful Professional career

P.O.11. Adapt at operating in other cultures, comfortable with different Nationalities and social contexts, able to determine and contribute to desirable social outcomes. Avoiding unethical behavior such as Fabrication, falsification of Data, committing plagiarism

P.O.12. Identify the timely opportunity and using innovation to pursue that opportunity to create value and wealth for the better men to the individual and the society at large.

PEO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO 1	█	█	█	█	█					█	█	
PEO 2		█	█	█		█	█	█	█	█		█
PEO 3	█	█	█	█	█	█	█	█	█	█	█	█

PO-GA Mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
PO1	■											
PO2		■										
PO3			■									
PO4				■								
PO5					■							
PO6						■						
PO7							■					
PO8								■				
PO9									■			
PO10										■		
PO11											■	
PO12												■

Programme Specific Outcomes

P.S.O.1. To develop the abilities to acquire deep knowledge of fundamental and core theoretical and programming concepts for holistic development

P.S.O.2. Design, develop and test the software systems for real-time socio- economic problems

P.S.O.3. Analyze and recommend appropriate IT Solutions

6. Candidate Eligibility for M.C.A. Programme Admission

Candidates who have passed in any one of the following or equivalent are eligible to apply:

(i)   BCA/Bachelor Degree in Computer Science or equivalent Degree. OR

(ii) B.Sc., /B.Com. / B.A. with Mathematics at 10th, +2 level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University).

Bridge Course on Basics in Computer Science

Course duration: 30 Hours

Course Modules:

Module1: Computer Organization and Architecture

Module2: Data Structures and Algorithms

Module3: Problem Solving Techniques

Module4: Operating Systems

Module5: Object oriented programming

Module6: Database Management System

Module 7: Software Engineering

Module 8: Computer Networks

Obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

7. Duration of the Programme, Medium and Training

The programme shall be of two years duration spread over four semesters under choice based credit system. The medium of instruction/study is English. Industrial training will bring knowledge in the software industry. Industrial visit may also be permitted to interact the students with the people in the software industry.

8. CBCS- Structure

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Core/Core LAB	16	16	21		53
Electives (i)Discipline– Centric	6	6	3		15
(ii Skill Enhancement	1	1	2		4
(iii)Summer Internship / Industrial Training/ Project			2	14	16
Ability Enhancement / Extension	1	1		1	3
Total Credits	24	24	28	15	91

Credit Calculation

Method of teaching	Hours	Credits
Lecture	1	1
Tutorial / Demonstration	1	1
Practical / Internship/self-Learning	2/1	1

9. Examinations

Examinations are conducted in semester pattern. The examination for the Semester I & III will be held in November/December and that for the Semester II and IV will be in the month of April/May.

10. Scheme for Evaluation and Attainment Rubrics

Evaluation will be done on a continuous basis and will be evaluated four times during the course work. The first evaluation will be in the 7th week, the second in the 11th week, third in the 16th week and the end– semester examination in the 19th week. Evaluation maybe by objective type questions, short answers, essay so recombination of these, but the end semester examination is a University theory examination with prescribed question paper pattern.

Attainment of Rubrics for Theory Courses

THEORY EXAMINATION

Evaluation of Internal Assessment

Test   :15 Marks (Best one out of Three Tests)

Seminar   :5 Marks

Assignment   :5 Marks

Total: 25Marks

*** No Internal Minimum

Attainment of Rubrics for Theory Courses

THEORY EXAMINATION

Evaluation of Internal Assessment

Test	:15 Marks (Best one out of Three Tests)
Seminar	:5 Marks
Assignment	:5 Marks

Total: 25Marks

*** No Internal Minimum

Evaluation of End Semester Examinations

Question Paper Pattern (Theory)

Section	Approaches	Mark Pattern	K Level	CO Coverage
A	One word (Answer all questions)	15X1 = 15 (MCQ)	K1-K2	CO1-CO5
B	100 to 200 words	5X4 = 20 (Analytical type questions)	K4-K6	CO1-CO5
C	500 to 1000 words	5X8 = 40 (Essay type questions)	K2-K3	CO1-CO5

Attainment Rubrics for Lab Courses

PRACTICAL / MINI PROJECT EXAMINATION

Evaluation of Internal Assessment

Test 1 : 50 Marks

Test 2 : 50 Marks   (Best one out of Two Tests)

Test 3 : 50Marks

Total : 50 Marks

*** No Internal Minimum

QUESTION PAPER PATTERN

Time duration: 3 Hours

Max. Marks: 75

Two Questions may be taken from the list of practical problems Marks

(i) Practical/Mini project

- Record Note Book- 10
- Problem Understanding- 10
- Implementation- 10
- Debugging and Modification- 10
- For correct output and viva - 10

(ii) Industrial Training

- Internal Assessment- 50
- Joint Viva-voce - (Internal Examiner 50 and External Examiner 50)

PASSING MINIMUM

The   candidate shall be declared to have passed in the theory/practical/Dissertation examination if the candidate secures:

(i)   50% marks in the EXT and

(ii)   50% in ESE and CIA put together

M.C.A - Course Structure

Internal & External Marks

Semester III

Type of the Course	Title of the Course	Credits	Hours		CIA	EXT	Total
			Theory	Practical			
Core – VII	Dot NET Technologies	4	5		25	75	100
Core – VIII	Big Data Analytics	4	4		25	75	100
Core - IX	Mobile Computing	4	4		25	25	100
Core Lab V	Dot NET Technologies Lab	3		4	50	50	100
	Mini Project	6		6	50	50	100
Elective – V	Cyber Security / Research Methodology / Computer Vision	3	4		25	75	100
Skill Enhancement Course – III	Social Networks	2	3		25	75	100
	Internship/ Industrial Visit/Field Visit / Research Knowledge Updation Activity	2	-	-	50	50	100
Total		28	20	10			

Semester IV

Title of the Course	Credits	Hours
Project with Viva Voce	14	
Extension Activity	1	
	15	

(First Year – 48 Credits & Second Year – 43 Credits ,**Total Credits : 91**)

Internship (minimum of 30 hours)**:** The students should submit certificate of attendance from the industry stating the nature of work done, duration and role played along with report (minimum of 20 pages) at the end of III semester for external evaluation.

Industrial Visit/Field Visit : A report based on the observation and learning outcome to be submitted (minimum of 10 pages) along with suitable evidences at the end of III semester for external evaluation.

Research Knowledge Updation Activity : A report to be submitted (minimum of 10 pages) based on the study made along with the completion certificate stating the work done (MOOC/NPTEL) at the end of III semester for external evaluation.

Internship/Industrial Visit/Field Visit/Research Knowledge Updation Activity:
Internal –50 Marks, External – 50 Marks

Mini Project & Project: Individual Project report should be submitted at the end of the respective semester for external evaluation.
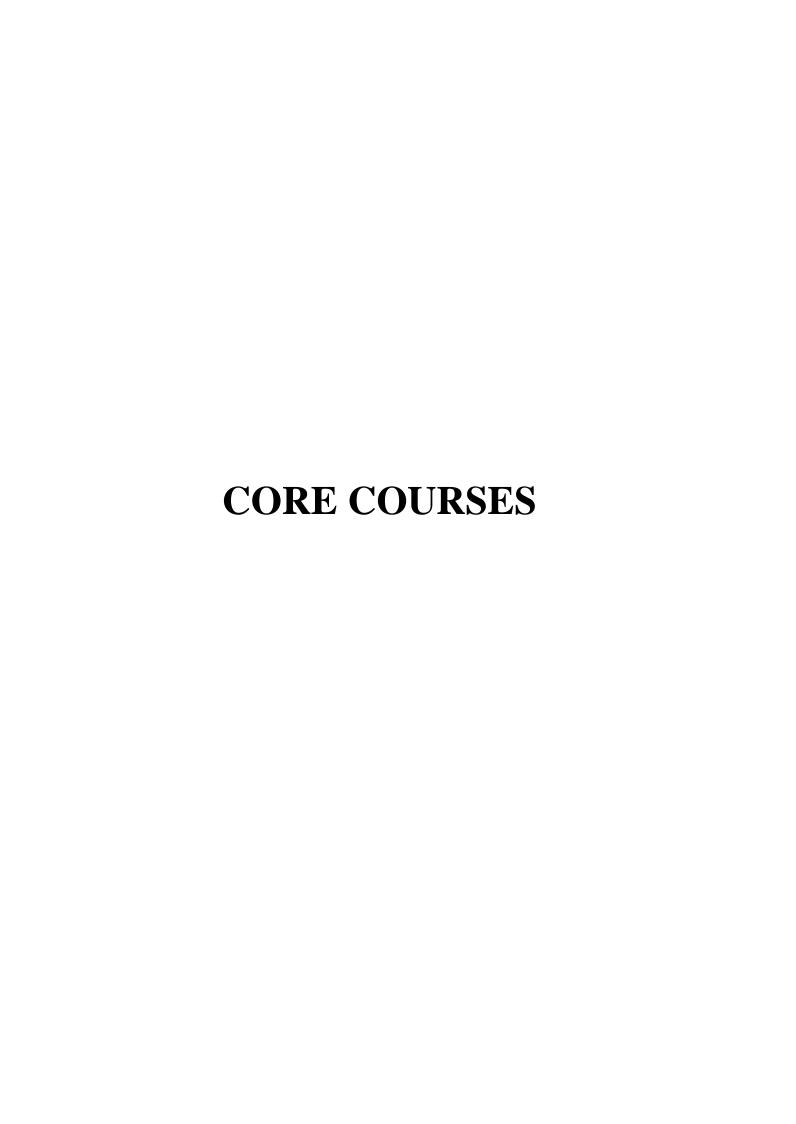Internal – 50 Marks, External – 50 Marks

Extension Activity (minimum of 10 hours)**:** Extension activity should be able to reflect, realize and apply his /her knowledge acquired during the course of study to the community in terms of but not limited to:

- Awareness Campaign
- Conduct of literacy programme
- Developing an application
- Formulation of a framework.
- Conduct of certificate programme.

A report should be submitted along with suitable evidences at the end of IV semester for external evaluation (minimum of 10 Pages).
Internal – 50 Marks, External – 50 Marks

CORE COURSES

Dot Net Technologies

Course Objectives:

- To get strong understanding of .NET Framework and C# programming.
- To get advanced programming skills in Visual Studio with C# language.
- To get advanced methods of manipulating data using Microsoft SQL Server.
- To get clear idea of how to develop real-time standalone, web applications using .NET Technologies.
- To get clear understanding and get experience in Microsoft Azure.

Unit-I

Introducing C#: .NET Framework - C# language - Visual Studio 2017 - Writing a C# Program: Visual Studio 2017 Development Environment - Console Applications - Desktop Applications - Variables and Expressions: Basic C# Syntax - Basic C# Console Application Structure - Variables - Expressions - Flow Control: Boolean Logic – Branching - Looping.

Unit-II

More About Variables: Type Conversion - Complex Variable Types - String Manipulation – Functions: Defining and Using Functions - Variable Scope - The Main Function - Struct Functions - Overloading Functions - Using Delegates - Debugging and Error Handling: Debugging in Visual Studio - Error Handling - Introduction to Object Oriented Programming: Object-Oriented Programming - OOP Techniques - OOP in Desktop Applications.

Unit-III

Defining Classes: Class Definitions in C# - System .Object - Constructors and Destructors - OOP Tools in Visual Studio - Class Library Projects - Interfaces Versus Abstract Classes - Struct Types - Shallow Copying Versus Deep Copying - Defining Class Members: Member Definitions - Additional Class Member Topics - Interface Implementation - Partial Class Definitions - Partial Method Definitions - The Call Hierarchy Window - Basic Cloud Programming: Cloud, Cloud Computing, and the Cloud Optimized Stack - Cloud Patterns and Best Practices - Using Microsoft Azure C# Libraries to Create a Storage Container - Creating an ASP.NET 4.7 Web Site That Uses the Storage Container - Advanced Cloud Programming and Deployment: Creating an ASP.NET Web API - Deploying and Consuming an ASP.NET Web API on Microsoft Azure - Scaling an ASP.NET Web API on Microsoft Azure.

Unit-IV

.NET Standard and .NET Core: Cross-Platform Basics and Must Know Terms – Need of .NET - Referencing and Targeting Frameworks - .NET Core - Building and Packaging a.NET Standard Library - Building a .NET Core Application with Visual Studio - Porting from .NET Framework to .NET Core - ASP.NET and ASP.NET Core: Overview of Web Applications – Use of ASP.NET - ASP.NET Web Forms - Creating ASP.NET Core Web Applications – Files: File Classes for Input and Output – Streams - Monitoring the File System - XML and JSON: XML Basics - JSON Basics - XML Schemas - XML Document Object Model - Converting XML to JSON - Searching XML with XPath.

Unit-V

LINQ: LINQ to XML - LINQ Providers - LINQ Query Syntax - LINQ Method Syntax - Ordering Query Results - Understanding the order by Clause - Querying a Large Data Set -Using Aggregate Operators - Using the Select Distinct Query - Ordering by Multiple Levels -Using Group Queries - Using Joins – Databases: Using Databases - Installing SQL Server - Express - Entity Framework - Code First Database - Finding the Database - Navigating Database Relationships - Handling Migrations - Creating and Querying XML from an Existing Database - Universal Apps: Windows Universal Apps - App Concepts and Design - App Development - Common Elements of Windows Store Apps - Windows Store.

Text book:

1. Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, "Beginning C#7 Programming with Visual Studio 2017", Wiley Publishing, 2018.Chapters: 1 to 10, 16 to 23, and 25.

Reference books:

1. Nagel, Christian, "Professional C 7 and .NET Core 2.0", Wrox Publishing, 2018.
2. Mehboob Ahmed Khan, Ovais, "C# 7 and .NET Core 2.0 High Performance", Packt Publishing, 2018

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Understand and learn .NET Framework and C# .NET	K1, K2	LO
CO2	Apply the concepts to develop the applications for real-time problem in C# .NET and ASP .NET	K3	IO
CO3	Analyse the feasibility of using .NET for real time problems	K4,K5	HO

K1- Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 -Create

 Mapping with Programme Outcomes:

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

 L - Low, M- Medium, S - Strong

Big Data Analytics

Course Objectives

- To introduce big data tools & Information Standard formats.
- To understand the basic concepts of big data.
- To learn Hadoop, HDFS and Map Reduce concepts.
- To teach the importance of NoSQL.
- To explore the big data tools such as Hive, HBase and Pig.

UNIT I

Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data.

Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.

Environment Big Data Analytics: Classification of Analytics – Challenges - Big Data Analytics important - Data Science - Data Scientist - Terminologies used in Big Data Environments – Basically Available Soft State Eventual Consistency - Top Analytics Tools.

UNIT II

Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop -RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem

UNIT III

MongoDB and Map reduce Programming: MongoDB: Mongo DB - Terms used in RDBMS and MongoDB - Data Types - MongoDB Query Language.

MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression

UNIT IV

Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.

UNIT V

Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive

Text Book

1. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley Publications, First Edition,2015

Reference Books

1. Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big data for dummies", John Wiley & Sons, Inc. (2013)
2. Tom White, "Hadoop The Definitive Guide", O'Reilly Publications, Fourth Edition, 2015
3. Dirk Deroos, Paul C. Zikopoulos, Roman B. Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications, 2014
4. Robert D.Schneider, "Hadoop For Dummies", John Wiley & Sons, Inc. (2012)
5. Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, "Hadoop In Action", Dreamtech Publications, 2010

Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools	K1-K6
CO2:	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.	K1-K6
CO3:	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB	K1-K6
CO4:	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	K1-K6
CO5:	To illustrate, develop and review the concepts of Pig database in Hadoop environment.	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5 Evaluate, K6- Create

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	-	-	-	-	L	-	-	-	-	-	-
CO2	S	-	M	-	M	L	-	-	-	-	-	-
CO3	S	-	S	-	S	L	-	-	-	S	S	S
CO4	S	-	S	-	S	L	-	-	-	S	S	S
CO5	S	-	S	-	S	L	-	-	-	S	S	S

S- Strong; M-Medium; L-Low

Mobile Computing

Course Objective:

- To introduce the concepts of wireless devices with signal, Antenna, Radio Frequencies, Signal Propagation.
- To introduce wireless communication and networking principles, that support connectivity to cellular networks, Wireless LAN, GSM, CDMA.
- To introduce the WAP Architecture, MANET and Routing

Unit-I

Introduction – Applications – History of wireless communication – A Simplified reference model - Wireless transmission – Frequencies for radio transmission – Regulations – Signals –Antennas - Signal propagation: Path loss of radio signals - Additional signal propagation effects - Multi-path propagation – Multiplexing – Modulation Chapters: 1, 2.1 to 2.6

Unit-II

Spread spectrum – Direct sequence spread spectrum – Frequency hopping spread spectrum – Cellular systems. Medium access control: Hidden and exposed terminals – Near and far terminals – SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, slotted Aloha, Carrier sense multiple access – Reservation TDMA – Multiple access with collision avoidance – Polling – CDMA – Spread Aloha multiple access. Chapters: 3.1 to 3.3, 3.4.1 to 3.4.4, 3.4.7 to 3.4.9, 3.5.1

Unit-III

GSM - Mobile services – System architecture – Radio interface – Protocols – Localization and calling – Handover – Security – New Data services. UMTS and IMT-2000 - Satellite Systems: Applications – Basics – Routing – Localization – Handover. Chapters: 3.6, 4.1.1 to 4.1.8, 4.4, 5.2 to 5.6

Unit-IV

Wireless LAN: Infrared vs. radio transmission – Infrastructure and ad-hoc network – IEEE 802.11 – System architecture – Protocol architecture – Physics layer – Medium access control layer – MAC management – Blue tooth. Mobile network layer: Mobile IP: Goals, assumptions and requirements – entities and terminology – packet delivery – Agent discovery – Registration – Tunneling and encapsulation Recent technologies Chapters: 7.1 to 7.3.5, 7.5, 8.1.1 to 8.1.6

Unit-V

WAP: Architecture – wireless datagram Protocol, Wireless transport layer security, Wireless transaction protocol, Wireless session protocol, Wireless application environment, Mobile ad-hoc networks – MANET Characteristics – Classification of MANETs, Routing of MANETs, Proactive Routing Protocol - DSDV, Reactive Routing Protocols – DSR, AODV.Chapter10.3.1 to 10.3.6 (Text Book 2- 6.1, 6.2, 6.4, 6.5, 6.6)

Text Books:

1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2013.
2. Kum Kum Garg, "Mobile Computing Theory and Practice", Pearson Education, 2014.

Reference Books:

1. Rifaat A. Dayen, "Mobile Data & Wireless LAN Technologies", Prentice Hall,1997.
2. Steve Mann and Scoot Schibli, "The Wireless Application Protocol", John Wiley & Inc., 2000.

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Understand the basic concepts of Mobile and Wireless Communication	K1, K2	LO
CO2	Understand the basic concepts of Spread Spectrum. Analysing the concepts of Medium Access Control.	K3	IO
CO3	Analyse the concepts of Global System for Mobile Communication and Satellite Communications. Understanding the basic concepts of Wireless LAN	K4	HO
CO4	Understand the basic concepts of Wireless LAN. Evaluate the performance of Mobile Network Layer	K2, K5	HO
CO5	Understand the basic concepts of Wireless Application Protocol and create a Mobile App with real time application. Analysing the concepts of Routing Protocols in MANET	K2, K4, K6	HO

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping Course outcomes with Programme outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	-	-	-	-	-	-	-	-	-	-	-
CO2	S	M	M	M	M	-	M	-	-	-	-	-
CO3	S	M	M	M	M	-	M	-	-	L	-	M
CO4	S	M	M	M	M	-	M	-	-	L	-	M
CO5	S	M	M	M	M	-	M	-	-	L	-	M

S- Strong; M-Medium; L-Low

Dot Net Technologies Lab

Course Objectives:

- To get strong understanding of .NET Framework and C# programming.
- To get advanced programming skills in C# .NET OOPs Concepts.
- To get advanced methods of manipulating data using Microsoft SQL Server.
- To get clear idea of how to develop real-time standalone, web applications using ASP .NET.
- To get clear understanding and get experience in Microsoft Azure.

Implement the following problems using C# with Visual Studio 2017

1. Demonstrate method overloading and method overriding
2. Class and Objects
3. Multilevel Inheritance
4. Interfaces
5. Demonstrate multiple type of Exceptions
6. Azure Storage Container Using the Microsoft Azure Storage Client Library
7. Read and Write a Data using Random Access Files
8. Employee management database using LINQ
9. Student management system using ASP.NET
10. Demonstrates simple Universal App.

Course Outcomes:

- Get a strong understanding of .NET Visual Studio platform
- Become a strong knowledge in C# .NET.
- Getting real-time application developing using .NET Cloud Technologies.

ELECTIVE COURSES

SEMESTER III

Cyber Security

Course Objectives:

- To understand the basics of Cybercrime and Computer forensics with protecting mechanism
- To explore the working principles of WLAN, Email and Smartphone along with security mechanism and guidelines
- To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of WiFi and its security measures
- To understand and learn the method of seize the digital evidence
- To learn and analyze the concepts of digital forensics with cybercrime prevention techniques

Unit – I

Introduction to cybercrime: Classification of cybercrimes – reasons for commission of cybercrime – malware and its type – kinds of cybercrime – authentication – encryption – digital signatures – antivirus – firewall – steganography – computer forensics – why should we report cybercrime – introduction counter cyber security initiatives in India – generating secure password – using password manager-enabling two-step verification – security computer using free antivirus.

Unit – II

Tips for buying online: Clearing cache for browsers – wireless LAN-major issues with WLAN-safe browsing guidelines for social networking sites – email security tips – introduction-smart phone security guidelines – purses, wallets, smart phones – platforms, setup and installation-communicating securely with a smart phone.

Unit – III

Cyber investigation roles: Introduction – role as a cybercrime investigator – the role of law enforcement officers – the role of the prosecuting attorney – incident response: introduction-post mortem versus live forensics – computer analysis for the hacker defender program-network analysis – legal issues of intercepting Wi-Fi transmission – Wi-Fi technology – Wi-Fi RF-scanning RF – eavesdropping on Wi-Fi – fourth amendment expectation of privacy in WLAN.

Unit – IV

Seizure of digital information: Introduction – defining digital evidence – digital evidence seizure methodology – factors limiting the wholesale seizure of hardware – other options for seizing digital evidence – common threads within digital evidence seizure – determining the most appropriate seizure method– conducting cyber investigations–demystifying computer/cybercrime – IP addresses – the explosion of networking – interpersonal communication.

Unit – V

Digital forensics and analyzing data: introduction – the evolution of computer forensics–phases of digital forensics-collection – examination-analysis – reporting – Cybercrime prevention: Introduction – crime targeted at a government agency.

Text books:

1. Dr. JeetendraPande, **"**Introduction to Cyber Security" Published by Uttarakhand Open University, 2017.(Chapter: 1.2-6.4,9.3-12.2)
2. Anthonyreyes, Kevin o'shea, Jim steele, Jon R. Hansen, Captain Benjamin R. Jean Thomas Ralph, "Cyber-crime investigations" - bridging the gaps between security professionals, law enforcement, and prosecutors, 2007.(Chapter: 4, 5, 6, 7, 8, 9,10)

Reference Books:

1. Sebastian Klipper, "Cyber Security" EinEinblickfur Wirtschafts wissens chaftler Fachmedien Wiesbaden,2015
2. John G.Voller Black and Veatch, "Cyber Security" Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.

Course Outcomes

On the successful completion of the course, students will be able to

CO1:	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India	K1- K6
CO2:	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics	K1- K6
CO3:	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	K1- K6
CO4:	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports	K1- K6
CO5:	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	K1- K6

K1- Remember, K2- Understand, K3- Apply , K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	-	L	M	L	M	M	-	M	-	-
CO2	M	S	-	L	M	L	M	M	-	M	-	-
CO3	M	S	L	L	M	L	M	M	-	M	M	L
CO4	S	M	L	S	M	L	S	M	-	M	-	-
CO5	M	S	M	L	S	L	M	S	-	S	-	-

S- Strong; M-Medium; L-Low

RESEARCH METHODOLOGY

UNIT I

Introduction - Meaning of Research – Objectives of Research – Types of Research – Motivation of Research – Research approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific method – Research process – Criteria of good Research – Problems encountered by Researchers in India. Defining the Research Problem: What is a Research problem - Selecting the Problem – Technique involved Defining a problem. Research Design: Meaning – Need for Research Design – Features of Good Design – Important concept relating to Research design – Different Research designs – Basic Principles of Experimental Designs

UNIT II

Sampling Design : Census and Sample Survey – Implications of a sample design – Steps in sample design - Criteria of selecting a sampling procedure – Characteristics of a good sample design – Different types of sample design – How to select a random sample – Random sample from an infinite Universe – Complex random sampling designs. Measurements and Scaling techniques : Measurement in Research – Measurement scales – Sources of error in Measurement – Test and sound Measurements – Technique of developing measurement tools – Scaling, Meaning of scaling – Scale classification bases – Important scaling techniques – Scale Construction techniques.

UNIT III

Chi-Square Test for large samples – Definition of Chi-Square – Limitations of Chi Square test - Chi-Square test as a test of goodness of fit and as a test of independence – Yate's correction and its applications. Analysis of Variance (ANOVA): Concept – One way ANOVA – ANOVA in test in Latin Square Design

UNIT IV

Data Collection: Methods of Data Collection – Collection of Primary Data – Observation Method – Interview method – Collection of data through Questionnaires – Collection of data through Schedules – Some other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection. Interpretation and Report Writing: Meaning of interpretation – Why interpretation – Technique of interpretation – Precaution in Interpretation – Significance of Report

UNIT – V

Introduction – Algorithmic Research Problems – Types of Solution Procedure/ Algorithm – Steps of Development of Algorithm – Steps of Algorithmic research – Design of Experiments and Comparison of Algorithms – Meta Heuristics for Combinational Problems. The Computer – Its role in Research – The Computer and Computer Technology – The Computer System – Important Characteristics - Computer Applications – Computer and Researchers.

Reference Books

1. C.R.Kothari, "Research Methodology Methods and Techniques", Second edition, New Age International Publishers, 2020.

2. R.Panneerselvam, "Research Methodology", PHI, 2009.

3. S.C Gupta and V.K Kapoor, "Fundamentals of Mathematical statistics", Sulthan Chand & Sons, Delhi, 2020.

4. Deepak Chawla and NeenaSondhi," Research Methodology: Concepts and Cases",Vikas Publishing House, 2016.

5. David M.Levine, David F Stephen,e al., "Business Statistics", Pearson Publisher, 7th edition,2017.

6. Ranjit Kumar "Research Methodology: A Step-by-step Guide for Beginners", Sage Publications Ltd, 2019.

Computer Vision

Course Objectives:

- To get understanding about Computer Vision techniques behind a wide variety of real- world applications.
- To get familiar with various Computer Vision fundamental algorithms and how to implement and apply.
- To get an idea of how to build a computer vision application with Python language.
- To understand various machine learning techniques that are used in computer vision tasks.
- To incorporate machine learning techniques with computer vision systems.

Unit-I

Basic Image Handling and Processing: PIL – the Python Imaging Library-Matplotlib-NumPy-SciPy-Advanced example: Image de-noising. **Local Image Descriptors:** Harris corner detector-SIFT - Scale-Invariant Feature Transform-Matching Geotagged Images.

Unit-II

Image to Image Mappings: Homographies-Warping images-Creating Panoramas. **Camera Models and Augmented Reality:** The Pin-hole Camera Model-Camera Calibration-Pose Estimation from Planes and Markers-Augmented Reality.

Unit-III

Multiple View Geometry: Epipolar Geometry-Computing with Cameras and 3D Structure-Multiple View Reconstruction-Stereo Images. **Clustering Images:** K-means Clustering-Hierarchical Clustering-Spectral Clustering.

Unit-IV

Searching Images: Content based Image Retrieval-Visual Words-Indexing Images- Searching the Database for Images-Ranking Results using Geometry-Building Demos and Web Applications. **Classifying Image Content:** K-Nearest Neighbors-Bayes Classifier-Support Vector Machines-Optical Character Recognition.

Unit-V

Image Segmentation: Graph Cuts-Segmentation using Clustering-Variational Methods. **OpenCV:** Python Interface-OpenCV Basics-Processing Video-Tracking.

Course Outcomes:

On the successful completion of the course, students will be able

CO1	To understand and recall computer vision and its application areas	
CO2	To develop build a computer vision system	
CO3	To apply and analyse a design range of algorithms for image processing and computer vision	K1-K6
CO4	To develop incorporate machine learning techniques with computer vision system	
CO5	To apply and analyse image segmentation and image registration	

K1- Remember, K2 - Understand, K3 - Apply , K4 - Analyze, K5 - Evaluate, K6 -Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	L	M	L	L	L	M	M	M	S	S	L
CO2	S	M	L	M	M	L	S	L	S	L	S	L
CO3	S	S	S	M	M	L	M	L	M	L	M	L
CO4	S	S	S	M	M	L	M	L	M	L	S	L
CO5	S	S	S	M	M	L	S	L	S	L	S	L

L - Low, M- Medium, S - Strong

Skill Enhancement Course

Social Networks

Course Objectives

- To learn about Social media, Social networking and Webcasts
- To understand and build a Word Press Powered Website
- To analysis the Social Networking & Micro-Blogging.
- To learn and analyze the Widgets & Badges.
- To explore the importance of Website optimization.

UNIT I: Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping -Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed

UNIT II: Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast- Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast- Webcasting

UNIT III: Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking & Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.

UNIT IV: Widgets & Badges: Highlighting Social Web Presence-Sharing and Syndicating Content Making Site More Interactive-Promoting Products and Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.

Unit V: Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan- Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and ―Defriending-Web 3.0 or The Semantic Web-Mobile Technology- Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come to Your Own Conclusions

Text Book

1. Deltina hay, A Survival Guide To social Media and Web 2.0 Optimization‖, Dalton Publishing, 2009

Reference Books

1. Miriam Salpeter, Social Networking for Career Success, Learning Express, 2011.
2. Miles, Peggy, Internet world guide to webcasting, Wiley, 2008
   Professionals", Wiley Publication,2015.

Course Outcomes

On the successful completion of the course, students will be able

CO1:	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts	K1-K6
CO2:	To comprehend, design and develop a Word Press Powered Website	K1-K6
CO3:	To understand, implement and perform evaluation of Social Networking and Micro-Blogging	K1-K6
CO4	To collaborate, implement and analyze the Widgets and Badges in social networking environment	K1-K6
CO5	To understand, illustrate and perform evaluation of web optimization for social networks	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	L	-	S	-	S	S	S
CO2	S	S	S	-	S	L	-	S	-	S	S	S
CO3	S	S	S	-	S	L	-	S	-	S	S	S
CO4	S	S	S	-	S	L	-	S	-	S	S	S
CO5	S	S	S	-	S	L	-	S	-	S	S	S

S- Strong; M-Medium; L-Low