DEPARTMENT **MCA – Computer Applications (Full Time)**

Curriculum & Syllabus

2019 Regulations

I SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19ETL1	Object Oriented Programming	2	-	4	4
2.	MCA19G001	Database Technologies	3	1	-	4
3.	MCA19G002	Computer Organizations	3	1	-	4
4.	MCA19G003	Software Engineering	3	1	-	4
5.	MMA190012	Mathematical Foundations for Computer Science	3	1	-	4
6.	MCA19GL01	Database Laboratory	-	-	4	2
TOTAL						**22**

II SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19ETL2	Data Structures And Algorithms	2	-	4	4
2.	MCA19G004	Java Programming	3	1	-	4
3.	MCA19G005	Computer Graphics and Multimedia Systems	3	1	-	4
4.	MCA19G006	Data Communication and Networks	3	1	-	4
5.	MCA19G007	Operating System	3	1	-	4
6.	MCA19GL02	Java Programming Laboratory	-	-	4	2
TOTAL						**22**

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III SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19ETL3	Object Oriented Analysis And Design	2	-	4	4
2.	MCA19G008	Advanced Java Programming	3	1	-	4
3.	MCA19G009	Enterprise Resource Planning	3	1	-	4
4.	MCA19G010	Data Mining And Warehousing	3	1	-	4
5.	MCA19GEXX	Elective-I	3	1	-	4
6.	MCA19GLXX	Online Courses				2
7.	MCA19GL03	Advanced Java Programming Laboratory	-	-	4	2
TOTAL						**24**

IV SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19ETL4	Web Programming	2	-	4	4
2.	MCA19G011	PHP Programming with MYSQL	3	1	-	4
3.	MCA19G012	Mobile Application Development	3	1	-	4
4.	MMA190021	Resource Management Techniques	3	1	-	4
5.	MCA19GEXX	Elective II	3	1	-	4
6.	MCA19GL04	PHP Programming Laboratory	-	-	4	2
TOTAL						**22**

DEPARTMENT **MCA – Computer Applications (Full Time)**

V SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19ETL5	Phython Programming	2	-	4	4
2.	MCA19G013	C# And .Net Framework	3	1	-	4
3.	MCA19G014	Open Source Software	3	1	-	4
4.	MCA19G015	Entrepreneurship Development	3	1	-	4
5.	MCA19GEXX	Elective III	3	1	-	4
6.	MCA19GLXX	Online Courses	-	-	-	2
7.	MCA19GL05	C# and .Net Programming Laboratory	-	-	4	2
TOTAL						**24**

**Only for Lateral Entries

VI SEMESTER						
S.NO	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P / R**	**C**
1.	MCA19GL06	Internship	-	-	-	1
2.	MCA19GL07	Project Work	-	-	15/15	15
TOTAL						**16**

Summary of Credits

1st Semester - 22

2nd Semester - 22

3rd Semester - 24

4th Semester - 22

5th Semester - 24

6th Semester - 16

Total - 130

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LIST OF ELECTIVES

Electives						
S.No	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19GE01	Internet of Things and Wireless Sensor Networks	3	1	0	4
2.	MCA19GE02	Grid and Cloud Computing	3	1	0	4
3.	MCA19GE03	Data Analysis and Business Intelligence	3	1	0	4
4.	MCA19GE04	Image Processing	3	1	0	4
5.	MCA19GE05	Soft Computing	3	1	0	4
6.	MCA19GE06	Semantic Web	3	1	0	4
7.	MCA19GE07	Service Oriented Architecture and Web Services	3	1	0	4
8.	MCA19GE08	Progressive Web Application Development	3	1	0	4
9.	MCA19GE09	Data Visualization	3	1	0	4
10	MCA19GE10	Embedded Systems	3	1	0	4
11	MCA19GE11	Big Data Analytics	3	1	0	4
12	MCA19GE12	Software Project Management	3	1	0	4
13	MCA19GE13	Security in Computing	3	1	0	4
14	MCA19GE14	Game Programming	3	1	0	4
15	MCA19GE15	Distributed Systems	3	1	0	4
16	MCA19GE16	Knowledge Managemenent	3	1	0	4
17	MCA19GE17	M-Commerce	3	1	0	4
18	MCA19GE18	Healthcare Information System				

DEPARTMENT **MCA – Computer Applications (Full Time)**

ONLINE COURSES

1. National Programme on Technology Enhanced Learning (NPTEL) - Online Courses

ONLINE COURSES						
S.No	**Sub.Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	MCA19OL01	Cloud Computing and Distributed Systems	0	0	0	2
2.	MCA19OL02	Introduction of Machine Learning	0	0	0	2
3.	MCA19OL03	Introduction to Programming in C	0	0	0	2
4.	MCA19OL04	Block chain Architecture Design and Use Cases	0	0	0	2
5.	MCA19OL05	Cloud Computing	0	0	0	2
6.	MCA19OL06	Computer Architecture	0	0	0	2
7.	MCA19OL07	Database Management System	0	0	0	2
8.	MCA19OL08	Introduction Of Internet of Things	0	0	0	2
9.	MCA19OL09	Scalable Data Science	0	0	0	2
10.	MCA19OL10	Software Testing	0	0	0	2
11.	MCA19OL11	The Joy of Computing using Python	0	0	0	2
12.	MCA19OL12	Programming- data structures and algorithm using python	0	0	0	2

2.SWAYAM – Online Courses

1.	MCA19OL13	Cyber Law	0	0	0	2
2.	MCA19OL14	Information Security	0	0	0	2
3.	MCA19OL15	E-Governance	0	0	0	2
4.	MCA19OL16	Information Technology	0	0	0	2
5.	MCA19OL17	Cryptography	0	0	0	2
6.	MCA19OL18	Graphics and Animation Development	0	0	0	2
7.	MCA19OL19	E-Content development	0	0	0	2

3. IBM – Online Courses

1.	MCA19OL20	Data Science	0	0	0	2
2.	MCA19OL21	Statistics 101	0	0	0	2
3.	MCA19OL22	Machine Learning with Python	0	0	0	2

MCA19ETL1 OBJECT ORIENTED PROGRAMMING 2 0 4 4

OBJECTIVE:

- The student will be able to understand the concepts of classes and object
- Define classes for a given situation for specific problem solving
- Reuse available classes after modifications if possible
- Possess skill in object oriented thought process

UNIT I **12Hrs**

Principles of OOPs: Programming paradigms - basic concepts - benefits of OOPs - applications of OOPs Introduction to C++: History of C++ - structure of C++ - basic data types - type casting - type modifiers- operators and control structures- input and output statements in C++ Classes and objects-class specification- member function specification- scope resolution operator- access qualifiers- instance creation.

UNIT II **12Hrs**

Functions: Function prototyping- function components- passing parameters- call by reference- return by reference- inline functions- default arguments- overloaded function - Pointers - Array of objects- pointers to objects- this pointer- dynamic allocation operators- dynamic objects.

UNIT III **12Hrs**

Constructors: Constructors- parameterized constructors- overloaded constructors- constructors with default arguments- copy constructors- destructors- static class members and static objects. Operator overloading - Overloading unary and binary operator- overloading the operator using friend function- stream operator overloading and data conversion.

UNIT IV **12Hrs**

Inheritance: Defining derived classes- single inheritance- multiple inheritance- multi-level inheritance- hierarchical inheritance- hybrid inheritance- constructors in derived and base class- abstract classes- virtual function and dynamic polymorphism.

UNIT V **12Hrs**

Exception Handling:Exception handling mechanism- multiple catch- nested try- rethrowing the exception - Streams in C++ - Stream classes- formatted and unformatted data- manipulators- file streams- file pointer manipulation- file open and close - Template functions and Template classes.

Total No. of Hrs: 60

REFERENCES:

1. Herbert Schilde (2017), *Complete Reference of C++*- (4th Ed)- McGraw Hill Education.
2. Core Ashok N. Kamthane(2006), *Object oriented Programming with ANSI & Turbo C++*,Pearson
3. H M Deitel& P J Deitel(2010), *C++: how to program*,Pearson Education.
4. Robert Lafore(2001),*Object Oriented Programming in Turbo C++*, Galgotia Publications.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19G001 **DATABASE TECHNOLOGIES** **3 1 0 4**

OBJECTIVES:

- Understand basic database concepts- including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Focus on advanced database topics- such as object relational database systems and the data warehouse**.**

UNIT I **12 Hrs**

Introduction: An Overview of Database Systems-Introduction to Database Design -The Relational Model - Relational Algebra And Calculus- SQL - Queries- Constraints- Triggers.

UNIT II **12 Hrs**

Storage And Indexing: Overview Of Storage And Indexing- Storing Data - Disks And Files- Tree-Structured Indexing- Hash-Based Indexing.

UNIT III **12 Hrs**

Transaction Management: Overview of Transaction Management- Concurrency Control- Crash Recovery.

UNIT IV **12 Hrs**

Object And Object Relational Databases: Concepts for Object Databases- Object Database Standards- Languages- and Design- Object-Relational and Extended-Relational Systems.

UNIT V **12 Hrs**

Emerging Technologies: XML and Internet Databases- Data Mining Concepts- Overview of Data Warehousing and OLAP- Emerging Database Technologies and Applications.

Total No. of Hrs: 60

REFERENCES:

1. Raghu Ramakrishnan & Johannes Gehrke(2004)- *Database Management Systems*(3rd ed), McGraw Hill.(UNIT I- II & III)
2. Elmasri-R&Navathe-S.B(2007) *Fundamentals of Database Systems*(5th ed), Pearson Education/Addison Wesley(UNIT IV & V).
3. Henry F Korth- Abraham Silberschatz & Sudharshan .S(2006) *Database System Concepts*(5th ed), McGraw Hill.

DEPARTMENT MCA – Computer Applications (Full Time)

MCA19G002 COMPUTER ORGANIZATIONS 3 1 0 4

OBJECTIVES:

- To impart the knowledge in the field of Digital Electronics.
- To understand the functional units of a standard PC and its working
- To understand Input-output and memory organization in a computer

UNIT I **12 Hrs**

Digital Fundamentals: Number Systems and Conversions – Boolean Algebra and Simplification – Minimization of Boolean Functions – Karnaugh Map - Logic Gates – NAND – NOR Implementation .

UNIT II **12 Hrs**

Combinational And Sequential Circuits: Design of Combinational Circuits – Adder / Subtracter – Encoder – Decoder – MUX / DEMUX – Comparators - Flip Flops – Master – Slave Flip Flop – Counters – Registers.

UNIT III **12 Hrs**

Central Processing Unit: General Register and Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and manipulation – program Control – RISC. Pipelining – Arithmetic- Instruction and RISC Pipelining.

UNIT IV **12 Hrs**

Computer Arithmetic: Introduction - Addition and Subtraction – Multiplication algorithms – Booth Multiplication Algorithm - Division Algorithms – Floating Point Arithmetic Operations and decimal Arithmetic operations.

UNIT V **12 Hrs**

IO And Memory Organization: Peripheral devices – I/O Interface – Asynchronous Data Transfer –Asynchronous serial Transfer- Modes of Transfer – priority Interrupt – Direct Memory Access – Input-output Processor. Memory Hierarchy- Main Memory RAM- ROM- Memory Connection to CPU- Auxiliary Memory (Magnetic disks- Magnetic Tapes)- Associative Memory (Hardware Organization- Match Logic- Read/write Operation)- Cache Memory .

Total No. of Hrs: 60

REFERENCES:

1. M. MorisMano, *Digital Logic and Computer Design*- Pearson Educations.
2. Malvino & Leech (2017) , *Digital Computer Fundamentals*(3rd ed.), TMH.
3. M.MorisMano (2017) ,*Computer System Architecture,* PHI .

MCA19G003 SOFTWARE ENGINEERING 3 1 0 4

OBJECTIVES:

- This course introduces the concepts and methods required for the construction of large software intensive systems.
- It aims to develop a broad understanding of the discipline of software engineering
- It seeks to complement this with a detailed knowledge of techniques for the analysis and design of complex software intensive systems.

UNIT I **12 Hrs**

The Process:The Software Process- Software process- Software Process Models- Linear Sequential Model- Prototyping Model- RAD Model- Evolutionary Software Process Models - Project Management Concepts-The Management Spectrum- People- The Product- The Process.

UNIT II **12 Hrs**

Software Process And Project Metrics: Measures- Metrics and Indicators- Metrics in the Process and Project domains- Software measurement - Metrics for Software Quality. Software Project Planning -Project Planning Objectives- Resources- Software Project Estimation- Decomposition Techniques- Empirical Estimation Models- Risk Analysis- Software Risks- Risk Projection.

UNIT III **12 Hrs**

Project Scheduling And Tracking: Basic concepts- The relationship b/w people and Effort- Defining a Task Set for Software Project- Scheduling. Software Quality Assurance – Quality Concepts- Quality movement- Software quality assurance- Software Reviews. Software Configuration Management - The SCM Process- Identification of Objects in the software configuration- Version Control- Change Control- SCM standards.

UNIT IV **12 Hrs**

Analysis Concepts And Principles: Requirement Analysis- Requirement Elicitation for Software-Analysis Principles - Software Prototyping- Specification. Analysis Modeling- Data Modeling - Functional modeling and Information Flow- Behavioral Modeling- The mechanics of Structured Analysis- The Data Dictionary.

UNIT V **12 Hrs**

Software Testing Techniques: Software Testing Fundamentals- White-Box Testing- Basis Path Testing- Control Structure Testing- Black-Box Testing. Software Testing Strategies - A strategic approach to Software Testing - Strategic Issues- Unit Testing- Integration Testing -Validation Testing- System Testing- The Art Of Debugging. T**otal No. of Hrs: 60**

REFERENCES:

1. Ian Sommerville (2017), *Software Engineering* (5th ed.) , Addision Wesley.
2. Pressman R. S (2017) ,*Software Engineering(* 5th ed.) , McGraw Hill.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MMA190012 MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE 3 1 0 4

OBJECTIVES:

- Ability to apply knowledge of computing and mathematics appropriate to the discipline.
- Ability to analyze a problem and identify and define the computing requirements to solution.
- Ability to design- implement and evaluate a computer-based system- process- component or program to meet desired needs.
- Ability to learn about graphs which is applicable in many fields.

UNIT I **12 Hrs**

Logic: Statements – Truth Table - Connectives – Normal Forms – Predicate Calculus – Inference Theory.

UNIT II **12 Hrs**

Combinatorics: Mathematical Induction –Pigeon Hole Principle – Principle of Inclusion and Exclusion – Recurrence Relations – Generating Functions.

UNIT III **12 Hrs**

Groups: Basic Concepts – Groups – Subgroups – Kernel – Cosets – Homomorphism – Lagrange-s theorem (simple theorems and problems).

UNIT IV **12 Hrs**

Graphs: Introduction to Graphs – Terminology – Matrix representation of Graphs –Incidence matrix – Adjacency matrix – Graph Isomorphism – Connectivity – Euler and Hamiltonian Paths (simple theorems and problems).

UNIT V **12 Hrs**

Trees: Definition of Tree – Five Equivalent Conditions on Tree – Spanning Trees – Minimal Spanning Tree – Prim-s algorithm – Dijkstra-s algorithm – Kruskals algorithm (simple theorems and problems).

Total No. of Hrs: 60

REFERENCES:

1. Veerarajan .T (2006) *Discrete Mathematics* (5th ed), Tata McGraw Hill Publishing Co.
2. Tremblay J,P & Manohar .R (2004), *Discrete Mathematical Structures with applications to Computer Science*", Tata McGraw Hill Publishing Co.
3. Kolman , Busby & Ross(2008) *Discrete Mathematical Structure(* 6th ed), Pearson.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19GL01 **DATABASE LABORATORY** **0 0 4 2**

OBJECTIVES:

- Student has to acquire basic concept of DBMS
- Students will be familiar with SQL and its use in DBMS.
- Student has to acquire knowledge of implementation DDL COMMANDS.
- Students will be able to develop real time applications.

1. Online reservation system
2. Banking System
3. Personal information
4. Student mark processing system
5. Hotel Management
6. Stock Maintenance
7. College admission system

Total No. of Hrs. needed to complete the Lab: 30

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19ETL2 DATA STRUCTURES AND ALGORITHMS 2 0 4 4

OBJECTIVES:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks,queues,lists,trees and graphs
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

UNIT I **12 Hrs**

Arrays: Array as an Abstract data type-Polynomial abstract data types-Sparse Matrixes-Representation of array- Stacks and Queues –Stacks Abstract data type-Evaluation of expressions-Linked Lists-Singly Linked Lists-Circular lists-Doubly linked lists.

UNIT II **12 Hrs**

Trees: Introduction-Binary Trees - Binary Tree Traversal- Inorder -Preorder- Postorder-Binary Search Trees-Balanced Trees-Threaded Binary trees-Threads-Inorder Traversal –Inserting a Node-Heaps-Priority Queues-Definition -Insertion and Deletion of Max heap.

UNIT III **12 Hrs**

Sorting: Insertion sort – Quick sort – Merge sort- Heap sort- Sorting on several keys- External sorting-k-way merging-Buffer Handling for Parallel Operation.

UNIT IV **12 Hrs**

Graphs: Representation – Operations-Depth first search-Breadth first search-spanning trees-Minimum Cost Spanning Trees- Kruskals Algorithm-Prims Algorithm-Shortest Paths-Single source/All Destination - Nonnegative Edge Costs-General Weights-Static Hashing-Dynamic Hashing.

UNIT V **12Hrs**

Algorithms: Divide and Conquer –Merge sort–Greedy Method-Knapsack Problem-Backtracking-The 8-Queens Problem-Branch and Bound-Traveling Sales Person Problem.

Total No. of Hrs: 60

REFERENCES:

1. Horowitz.E. Sahni-S& d Mehta (2002) *Fundamentals of Data Structures in C++* (2nd ed), Galgotia
2. Weiss M.A (1994), *Data structures & Algorithm Analysis in C++*- (3rd ed) , Benjamin cummings.
3. Sara Baase (1998) *Computer Algorithms – Introduction to Design and Analysis* ,(3rd ed) AW.

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DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19G004 **JAVA PROGRAMMING** **3 1 0 4**

OBJECTIVES:

- Understand fundamentals of programming such as variables- conditional and iterative execution- methods- etc.
- Understand fundamentals of object-oriented programming in Java- including defining classes- invoking methods- using class libraries- etc.
- Be aware of the important topics and principles of software development.

UNIT I **12 Hrs**

Introduction to Java: Features of Java - Object Oriented Concepts - Lexical Issues - Data types - Variables - Arrays - Operators - Control Statements

UNIT II **12 Hrs**

Classes and Objects: Methods - Constructors – Garbage Collection-Finalize() method-Overloading methods – Access Control – Static and final methods – Nested and Inner Classes – Inheritance – Overriding methods – Using super – Abstract class

UNIT III **12 Hrs**

Packages: Access Protection – Importing packages – Interfaces – Exception Handling – – Multithreaded Programming-Thread Class – Synchronization – Messaging – Runnable Interface -Multiple threads–Inter thread communications – Deadlock – Threads –Suspending - Resuming - Stopping

UNIT IV **12 Hrs**

I/O Streams: File Streams- Byte Streams-Character Streams – Applets –Applet Class - Applet Architecture-– String Handling - String Buffer – Java utility-Collection Class-String Tokenizer-Date-Calendar-Gregorian Calendar.

UNIT V **12 Hrs**

Socket programming: Basics – Proxy Servers – TCP / IP Sockets – Net Address – URL – Datagrams – Working with windows using AWT Classes – AWT Controls – Layout Managers and Menus.

Total no. of Hrs : 60

REFERENCES:

1. Arnold K & Gosling J(2008) *The Java Programming Language* (2nd ed).
2. Naughton P & Schildt H, *Java 2 The Complete Reference*(5th ed), TMH.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19G005 COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS 3 1 0 4

OBJECTIVES:

- Designed to provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology- progress- issues- and trends.
- A thorough introduction to computer graphics techniques- focusing on 3D modeling- image synthesis- and rendering.

UNIT I **12 Hrs**

Introduction: Overview of Graphics System – Bresenham-s Algorithms – Line Drawing and Circle Drawing Algorithms - DDA - Line Clipping - Text Clipping

UNIT II **12 Hrs**

2D Transformations: Translation-Scaling and Rotations - Interactive Input methods - Polygons - Splines – Bezier Curves - Window view port mapping transformation

UNIT III **12 Hrs**

3D Transformations: 3D Concepts - Projections – Parallel Projection - Perspective Projection – Visible Surface Detection Methods - Visualization and polygon rendering – RGB Color models - animation – Key Frame systems - General animation functions - morphing.Histograms

UNIT IV **12 Hrs**

Overview of multimedia: Multimedia hardware & software - Components of multimedia – Text- Image – Graphics – Audio – Video – Animation – Authoring.

UNIT V **12 Hrs**

Multimedia systems and applications: Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand

Total no. of Hrs : 60

REFERENCES:

1. Hearn D and Baker M.P(2004) *Computer graphics – C Version*(2nd ed.), Pearson Education.
2. Siamon J. Gibbs &Dionysios C. Tsichritzis (1995) *Multimedia programming*, Addison Wesley.
3. John Villamil, Casanova &LeonyFernanadez Eliar (1998),*Multimedia Graphics*, PHI.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19G006 DATA COMMUNICATION AND NETWORKS 3 1 0 4

OBJECTIVES:

- To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
- To study the detection and correction of errors, link control and link protocols of data link layer
- To study about the standardized data interface and it's working principle
- To study the logic of link mechanisms used in networks and different layers of TCP/IP.

UNIT I **12 Hrs**

Data Communication Introduction: Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks –OSI model- Functions of the layers- Transmission media- Guided media – Unguided media – Transmission impairment – Performance.

UNIT II **12 Hrs**

Error Control And Data Link Protocols : Error detection and correction- Types of errors – Error Detection Techniques - Data link control - Flow control – Error control - Data link protocols –Asynchronous protocols – Synchronus protocols-Character oriented protocols – BIT oriented protocols

UNIT III **12 Hrs**

Multiplexing And Switching : LAN Project 802 – Ethernet – Token bus – Token ring – FDDI- IEEE 802.6 (DQDB) – SMDS - Switching

UNIT IV **12 Hrs**

X.25, FRAME RELAY, ATM : X.25 Layers - Frame relay - Introduction – Frame relay operation – Frame relay layers – Congestion control – Leaky bucket algorithm - ATM: Design goals – ATM architecture – ATM layers – ATM applications. SONET / SDH: Synchronous transport signals – Physical configuration – SONET layers – Applications.

UNIT V **12 Hrs**

Networking Devices And Tcp / Ip Protocol Suite : Repeaters – Bridges – Gateways – Routing algorithms – Overview of TCP/IP - Application layer - Domain Name System (DNS) – Telnet – File Transfer Protocol (FTP) – Trivial File Transfer Protocol (TFTP) – Simple Mail Transfer Protocol (SMTP), Simple Network Management Protocol(SNMP)

REFERENCES:

1. Behrouz A.Forouzan(2000), *Data Communication and Networking*(2nd ed.), Tata McGraw Hill.
2. William Stallings(2003), *Data and Computer Communication*(8th ed.) Pearson Education.
3. Andrew Tannenbaum.S(2003),*Computer Networks*(4th ed.), Pearson Education.

MCA19G007 **OPERATING SYSTEM** **3 1 0 4**

OBJECTIVES:

- To understand the structure and organization of the file system.
- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.

UNIT I **12 Hrs**

Introduction: Definition of OS-Mainframe System-Desktop Systems-Multi processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure-System Components-Services-System Calls-System Programs-System Design and Implementation- Process concepts: Process Scheduling-Operations on Processes-Co-operating Processes-Inter Process Communication

UNIT II **12 Hrs**

CPU Scheduling: Scheduling Concepts-Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling-Process synchronization-Critical Section Problem- Peterson-s solution problem- Synchronization Hardware-Semaphores-Classical Problems of Synchronization-Critical Regions-Monitors-Deadlocks-Characterization-Handling Deadlocks-Deadlock Prevention-Avoidance-Detection-Deadlock Recovery

UNIT III **12 Hrs**

Memory management: Storage Hierarchy-Storage Management Strategies-Contiguous-Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition-Swapping-Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging-Segmentation-Page Replacement Methods-Locality-Working Sets

UNIT IV **12 Hrs**

I/O and file systems: Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation - Allocation Methods-Free Space Management- Disk structure- Disk attachment – Disk scheduling – Disk Management-Case Study: Linux System.

UNIT V **12 Hrs**

Distributed Operating Systems: Types of distribute OS-Network structure and topology - design issues - naming and transparency-remote file access- Stateful versus stateless service - Event ordering - mutual exclusion – atomicity - concurrency control Deadlock handling - Election Algorithms-Real time systems - Multimedia systems

Total no. of Hrs : 60

REFERENCES:

1. Silberschatz& Galvin(2004) *Operating System Concepts*-(6th ed.)- John Wiley & Sons- Inc.
2. Milankovic M(1992) *Operating System Concepts and Design*- (2nd ed.)- McGraw Hill.
3. Bhatt-P.C(2004) - *An Introduction to Operating Systems-Concepts and Practice*- Prentice Hall Of India.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19GL02 JAVA PROGRAMMING LABORATORY 0 0 4 2

OBJECTIVES:

- Develop the ability to solve real-world problems through Java programming
- Develop efficient Java applets and applications
- Become familiar with the fundamentals and acquire programming skills in the Java language.

1. Write a Java program using inheritence to create a base class Teacher and a sub class PhysicsTeacher. PhysicsTeacher extends the designation and college properties and work() method from base class.

2. Write a Simple Java program to calculate bonus for different departments using method overriding

3. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle- Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

4. Write a java program that simulates a traffic light. The program lets the user select one of three lights: red- yellow- or green with radio buttons. On selecting a button- an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.

5. Write a Java Program that reads a file and displays the file on the screen- with a line number before each line.

6. Write a Java Program that displays the number of characters- lines and words in a text file.

7. Develop an applet programs to display basic shapes and fill them - draw different items using basic shapes and set background and foreground colors using graphics class.

8. Write an applet program to draw a car.

9. Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button “Compute” is clicked.

10. Write a Java program to send current date and time to all the clients using client server communication.

Total No. of Hrs. needed to complete the Lab: 30

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19ETL3 OBJECT ORIENTED ANALYSIS AND DESIGN 2 0 4 4

OBJECTIVES:

- Develop a working understanding of formal object-oriented analysis and design processes.
- Develop an appreciation for and understanding of the risks inherent to large-scale software development-
- Develop the skills to determine which processes and OOAD techniques should be applied to a given project.

UNIT I **12 Hrs**

Introduction OOSD Methodology - Unified approach – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle – S/W device process- High quality Software Object Oriented System Development- Reusability.

UNIT II **12 Hrs**

Methodology and UML Introduction – Survey – Rumbugh- Booch- Jacobson methods – Patterns – Frameworks – Unified approach – Unified modeling language – Static and Dynamic models – UML diagrams – Class diagram – Use case diagrams – Dynamic modeling diagrams – Interaction Diagrams- sequence diagrams.

UNIT III **12 Hrs**

Object Oriented Analysis Identifying Usecase – Business object analysis – Usecase driven object oriented analysis – Usecase model – Documentation – Introduction- classification theory- Approaches for Identifying classes – Identifying object- relationships- attributes- methods – Super-sub class – Aggregation Class Responsibility – Object responsibility.

UNIT IV **12 Hrs**

Object Oriented Design -Design process – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability – DBMS – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface

UNIT V **12 Hrs**

Software Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing.

Total no. of Hrs : 60

REFERENCES:

1. Ali Bahrami(2003), *Object Oriented System Development*, McGraw Hill International Edition.
2. Craig Larman(2002) *Applying UML and Patterns*(2nd ed.) Pearson.
3. James Rumbaugh(2004) *Object Oriented Modeling Language* (2nd ed.), PHI.

MCA19G008 ADVANCED JAVA PROGRAMMING 3 1 0 4

OBJECTIVES:

- To learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
- To create dynamic web pages, using Servlets and JSP
- To design a resusable software component, using Java Bean
- To invoke the remote methods in an application using Remote Method Invocation (RMI)
- To understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB).

UNIT I **12 Hrs**

Introduction of JDBC: Types of JDBC Drivers-Implementing JDBC Statements and ResultSet – ResultsetMetaData - Connection Pooling –Writing JDBC applications

UNIT II **12 Hrs**

Servlet: The Java Servlet Architecture – The GenericServlet and HttpServlet Classes – Building a Servlet – The ServletContext – Using Servlets to Retrieve HTTP Data- Concept of cookie- Session Tracking

UNIT III **12 Hrs**

Introduction to JSP: Components of a JSP - JSP Directives - JSP Scripting Elements- JSP Actions - Managing session using JSP - Error Handling in JSP - Writing custom tags -JSTL - Using JavaBeans inside a JSP Page - Using JDBC in JSP -Writing simple JSP Page

UNIT IV **12 Hrs**

Java Networking**:** Introduction to RMI - Object Serialization - deserialization - CORBA Overview

UNIT V **12 Hrs**

Introduction to Enterprise JavaBeans: Enterprise programming - session EJBs - EJB clients - Entity EJBs - message driven beans **Total no. of Hrs : 60**

REFERENCES:

1. Santosh Kumar K(2008),*JDBC- Servlets and JSP Black Book* ,Kogent Solutions New Edition
2. Gerald Brose, Andreas Vogel & Keith Duddy(2001), *Java Programming with CORBA: Advanced Techniques for Building Distributed Applications*(3rd ed.)", Wiley Publication.
3. James Goodwill Richard Hightower(2003*), Professional Jakarta Struts 1.1*(1st ed.) , Wiley Publication.

DEPARTMENT **MCA – Computer Applications (Full Time)**

MCA19G009 **ENTERPRISE RESOURCE PLANNING** **3 1 0 4**

OBJECTIVES:

- To make student able to build an understanding of the fundamental concepts of ERP systems, their architecture
- To learn different modules in ERP.
- To be able to map business processes using ERP concepts and techniques

UNIT I **12 Hrs**

Introduction to ERP: Evolution of ERP – ERP Definition – Reasons for the growth of the ERP market – The Advantages of ERP – Business Modeling – Integrated Data Model – Supply and Demand Chain.

UNIT II **12 Hrs**

ERP and Related Technologies: Business Process Reengineering (BPR) – Management Information Systems (MIS) – Decision Support System (DSS) – Executive Information System (EIS) - Data Warehousing - Data Mining – OLAP - BOM - MTO - MTS

UNIT III **12 Hrs**

ERP Modules: Finance - Plant Maintenance - Materials Management – Human Resources – Sales and Marketing – Purchase – Manufacturing – Plant Maintenance.

UNIT IV **12 Hrs**

ERP Implementation Life Cycle: ERP Market : SAP AG – Baan Company – Oracle Corporation – People Soft – JD Edwards

UNIT V **12 Hrs**

Vendors- Consultants and users : In-house Implementation – Pros and Cons – Vendors Consultants – End Users – Future Directions in ERP – ERP case studies.

Total no. of Hrs : 60

REFERENCE:

1. Alexis Leon (2006), *Enterprise Resource Planning Demystified*, Tata McGraw-Hill, New Delhi.

MCA19G010 **DATA MINING AND WAREHOUSING** **3 1 0 4**

OBJECTIVES:

- Will learn the techniques for Developing Proper Data Warehouses
- Designed to know about the recent techniques in data mining
- Understand and implement classical models and algorithms in data warehouses and data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

UNIT I **12 Hrs**

Introduction to Data Warehousing: Defining features - architecture of a Data Warehousing – Data Warehousing Schema – Dimensional modeling – ETL Process – Testing- Growth and maintenance - OLAP in Data Warehousing.

UNIT II **12 Hrs**

Data Mining: Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction –Mining Frequent patterns - Associations & correlations - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint Based Association Mining.

UNIT III **12 Hrs**

Classification and Prediction: Issues Regarding Classification and Prediction – Classification by Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines - Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor.

UNIT IV **12 Hrs**

Cluster Analysis: Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods .

UNIT V **12 Hrs**

Mining Object: Spatial- Multimedia- Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web

Total no. of Hrs : 60

REFERENCES:

1. Jiawei Han & Micheline Kamber(2008), *Data Mining Concepts and Techniques* (2nd ed) , Elsevier, Reprit.
2. Soman,K.P, ShyamDiwakar&Ajay-V(2006), *Insight into Data mining Theory and Practice*, Easter Economy Edition, Prentice Hall of India.

MCA19GL03 ADVANCED JAVA PROGRAMMING LABORATORY 0 0 4 2

OBJECTIVES:

- Student will be able to develop distributed business applications- develop web pages using advanced server-side programming through servlets and Java server pages.

1. Developing a simple Application using JDBC.
2. On-line Transactions – Database connectivity.
3. Implementation of Socket Programming.
4. Implementation of Date time server.
5. Implementation Object Serialization using RMI.
6. Client side / Server side scripting programs for the Web Pages.
7. Developing a simple Application using Servlets.
8. Creating JSP program using JavaBeans
9. Developing a simple Application using JSP.
10. Developing a web application for income-tax calculation using session bean.

Total No. of Hours needed to Complete the Lab : 30

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19ETL4 **WEB PROGRAMMING** **3 1 0 4**

OBJECTIVES:

- To understand the concepts and architecture of the World WideWeb.
- To understand and practice mark uplanguages
- To understand and practice embedded dynamic scripting on client side InternetProgramming
- To understand and practice web development techniques onclient-side

UNIT I **12 Hrs**

Introduction To WWW: Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.

UNIT II **12 Hrs**

UI Design Markup Language (Html)**:** Introduction to HTML and HTML5 - Formatting and Fonts - Commenting Code – Anchors – Backgrounds – Images – Hyperlinks – Lists – Tables – Frames - HTML Forms.Cascading Style Sheet (CSS): The need for CSS, Introduction to CSS – Basic syntax and structure - Inline Styles – Embedding Style Sheets - Linking External Style Sheets – Backgrounds - Manipulating text - Margins and Padding - Positioning using CSS.

UNIT III **12 Hrs**

Introduction To Java Script: Introduction - Core features - Data types and Variables - Operators, Expressions, and Statements - Functions - Objects - Array, Date and Math related Objects - Document Object Model - Event HandlingControlling Windows & Frames and Documents - Form handling andvalidations.

UNIT IV **12 Hrs**

ASP: The origin of ASP-ASP connection with IIS – set up Issues and management- ASP object model in overview – Handling Request and Response – clinet Server – interaction – the ASP request and Response Objects – Working with Form and Query String Collections _ Using Cookies and Server Variables – Other Request and response techniques

UNIT V **12 Hrs**

ASP Applications and Sessions: Managing the stte on the Web – the ASP application and Session Objects – Server Process and the ASP server object – Server side processing in Dynamic pages – Server side Includes – the ASP Server Object – Scripting Objects- Creating Instances of Objects and Components – Scripting – dictionary Scripting –File System – Scripting – Text Stream Objects

REFERENCS:

1. Harvey Paul Deitel Associates, Harvey Deitel and Abbey Deitel(2011), *Internet and World Wide Web - How To Program*(5th ed.), Pearson Education.
2. Thomas A Powell & Fritz Schneider(2013), JavaScript: The Complete Reference(3rd ed), Tata McGraw Hill.
3. David Flanagan(2011),*JavaScript: The Definitive Guide*(6th ed), O'Reilly Media.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19G011 PHP PROGRAMMING WITH MYSQL 3 1 0 4

UNIT I **12 Hrs**

Introduction to PHP: Evaluation of Php - Basic Syntax – variables – constant - Data type - Operators and Expression - Decisions and loop Making Decisions - Doing Repetitive task with looping - Mixing Decisions and looping with Html

UNIT II **12 Hrs**

Function :Define a Function - Call by value and Call by reference - Recursive function -String Creating and accessing - String Searching & Replacing String - Formatting String - String Related Library function

UNIT III **12 Hrs**

Array :Anatomy of an Array - Creating index based and Associative array Accessing array - Element Looping with Index based array - Looping with associative array using each () and foreach() - Some useful Library function - Handling Html Form with Php Capturing Form - Data Dealing with Multivalue filed - and Generating File uploaded form - redirecting a form after submission.

UNIT IV **12 Hrs**

Working with file and Directories :Understanding file& directory - Opening and closing - a file Coping, renaming and deleting a file -working with directories - Creating and deleting folder -File Uploading & Downloading - Session and Cookie - Introduction to Session Control -Session Functionality - What is a Cookie - Setting Cookies with PHP -Using Cookies with Sessions - Deleting Cookies - Registering Session variables 0- Destroying the variables and Session - Exception Handling - Understanding Exception and error - Try, catch, throw - Error tracking and debugging.

UNIT IV **12 Hrs**

Database Connectivity with MySql :Introduction to RDBMS - Connection with MySql Database - Performing basic database operation(DML) (Insert, Delete, Update, Select) - Setting query parameter -Executing queryJoin (Cross joins, Inner joins, Outer Joins, Self joins.)

REFERENCE:

1. Learning PHP, MySQL, books by ‘ O’ riley Press

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19G012 MOBILE APPLICATION DEVELOPMENT 3 1 0 4

OBJECTIVES:

- Apply layout management and multi-layout definition techniques to create adaptable user interfaces for mobile applications that share a common data model.
- Manage user data and multimedia on a mobile device via the Android framework libraries.
- Use the sensors available on mobile devices to enhance user interaction and feedback.

UNIT I **12 Hrs**

Introduction To Mobile Application: Mobile Telephony – Mobile device – Communication standard - GSM-CDMA- UMT – Introduction to 1G / 2G / 3G / 4G – LTE – Mobile application categories – factors in developing mobile applications – Software Architecture – application models framework and tools – HTML 5 – Java Script – AJAX.

UNIT II **12 Hrs**

Introduction to Android: Installation – Android Architecture – Application Fundamentals – SDK features – development framework – Android Application and Activities – creative user interface – layouts – views – menu – graphics – animation – intents.

UNIT III **12 Hrs**

Android File management tool: Database Storage – working with SQ-Lite – GPS functionality – location based API – creating map based activities – geocoding location based service – handling audio and video service – Networking- using Bluetooth – Managing connectivity – Telephony – SMS.

UNIT IV **12 Hrs**

Mobile Operating System: iOs Programming - Introduction to Objective C - Class objective – methods – interface – inheritance – Introduction to foundation framework classes – file handling – property list. NSCopy and archiving selectors and targets – Dynamic Binding -iPhone Architecture – Development IDE – XCODE-interface builder- Creating simple applications – Handling basic interaction – creating basic view controllers – Monitoring and action – Creating advanced view controllers.

UNIT V **12 Hrs**

Interface: Storyboarding integration – Programmatic Interface creation – integrating with core services – Email contracts – data actions preference – files and addresses – camera – Webkit – database with iPhone applications – code data integration – advanced controllers – navigation controllers – integration with Core Service – core audio and video – event handling – gesture recognition – maps an location protocols and categories – communication with the service – using the accelerometer – Bluetooth Programming.

Total no.of.Hrs : 60

REFERENCES:

1. Retomeier (2010) ,*Profession Android2 application Development* (2nd ed), Wiley Publications
2. Dimarzio J, I(2010),*Android – a programmer-s guide*, McGraw Hill.
3. James A. Brannan & Blake Ward(2011),*iOs SDK Programming*, Tata McGraw Hill.

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DEPARTMENT OF COMPUTER APPLICATIONS

MMA190021 RESOURCE MANAGEMENT TECHNIQUES 3 1 0 4

OBJECTIVES:

- Will learn to deploy efficient and effective ways for allocation of an organization-s resources when and where they are needed.
- Will learn to implement resource management like planning- allocating and scheduling of resources to tasks- which typically include manpower- machines- money and materials.
- Learn to give an impact on schedules and budgets as well as resource leveling and smoothing.

UNIT I **12 Hrs**

Linear programming: Formulation of LPP - Simplex method – Big M method – Two phase method

UNIT II **12 Hrs**

Transportation and assignment: Formulation of Transportation problem – North West corner method – Least cost method – Vogel-s approximation method – Optimality test – MODI method – Degeneracy – Assignment problem: Hungerian method – Travelling salesman problem

UNIT III **12 Hrs**

Integer and Dynamic Programming: Linear Integer programming – Cutting plane method –Branch and Bound method – Dynamic programming - Formulation

UNIT IV **12 Hrs**

CPM And PERT: Network representation – Fulkerson-s rule – Critical path method – Scheduling of activities – Earliest and Latest times – Float and Slack times – Critical path – PERT – Probability for project duration

UNIT V **12 Hrs**

Queuing: Elementary concepts – Pure Birth and Death process – Single server Markovian models with infinite and finite capacity – Multi server Markovian models with infinite and finite capacity

Total no. of Hrs : 60

REFERENCES:

1. Taha H.A(2010), *Operations Research : An Introduction(* 9th ed), Pearson Education.
2. Sundaresan V. et al.(2009), *Resource Management Techniques*, A.R. Publications.
3. Ravindran- Phillips & Solberg(2007), *Operations Research: Principles and Practice(*2nd ed.), John Wiley & Sons.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GL04 PHP PROGRAMMING LABORATORY 0 0 4 2

OBJECTIVES:

- To learn how to create a simple web page using html along with the usage of style sheets- lists- creation or tables with borders- padding and colors.
- Use Cascading Style Sheets (CSS) to design web pages
- Use CSS to create web pages with specialized fonts and design elements
- Use Javascript to control browser frames and windows

1. Write a php program to display today's date in dd-mm-yyyy format.
2. Write a php program to check if number is prime or not.
3. Write a php program to print first 10 Fibonacci Numbers.
4. Create HTML page that contain textbox, submit / reset button. Write php program to display this information and also store into text file.
5. Write a php script to read data from txt file and display it in html table (the file contains info in format Name: Password: Email)
6. Write a PHP Script for login authentication. Design an html form which takes username and password from user and validate against stored username and password in file.

7. Write PHP Script for storing and retrieving user information from MySql table.
   1. Design A HTML page which takes Name, Address, Email and Mobile No. From user (register.php)
   2. Store this data in Mysql database / text file.
   3. Next page display all user in html table using PHP (display.php)

8. Write a PHP script for user authentication using PHP-MYSQL. Use session for storing username.

Total No. of Hrs. needed to Complete the Lab : 30

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19ETL5 PYTHON PROGRAMMING 2 0 4 4

OBJECTIVES:

- To learn how to design Python applications.
- To learn how to write loops and decisions statements in Python
- To learn how read and write files in Python.
- To learn how to use inhertitance in Python for reusability.

UNIT I **12 Hrs**

Data Types and Data Structures: Introduction to Python - using the Python interpreter- Overview of programming in Python- Python built-in types- Arithmetic in Python- Program input and Program output- Variables and assignment. Strings and string operations - List basics - List operations- Dictionaries- Dictionary basics and Tuples

UNIT II **12 Hrs**

Control Structures: Control Statements: if statements- while statement- for statements- functions- formal arguments- variable-length arguments- Exceptions- detecting and handling exceptions.

UNIT III **12 Hrs**

Classes files and modules: Introduction to Classes and Objects: classes- class attributes- instances- instance attributes- binding and method invocation- inheritance- polymorphism- Built-in functions for classes and instances.

UNIT IV **12 Hrs**

Files and input/output: reading and writing files- methods of file objects- using standard library functions- dates and times

UNIT V **12 Hrs**

Database and : Python database application programmer‟s interface (DB- API)- connection and cursor objects - Type objects and constructors - python database adapters. Creating simple web clients - introduction to CGI- CGI module- building CGI applications - python web application frameworks - Django.

Total no. of Hrs : 60

REFERENCES:

1. Wesley J. Chun (2000), *Core Python Programming* (2nd ed.), Pearson Education.
2. Guido Van Russom, Fred L.Drake *(*2003), *An Introduction to Python*, Network Theory Limited.
3. Magnus Lie Hetland (2009) , *Beginning Python: From Novice To Professional* (2nd ed.).

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19G013 C# AND .NET FRAMEWORK 3 1 0 4

OBJECTIVES :

- Understand the foundations of CLR execution
- Learn the technologies of the .NET framework
- Know the object oriented aspects of C#
- Learn web based applications on .NET(ASP.NET)

UNIT I **12 Hrs**

Introduction To **C# :** Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing**.**

UNIT II **12 Hrs**

Object Oriented Aspects of C# : Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT III **12 Hrs**

Application Development on .NET : Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV **12 Hrs**

Web Based Application Development on .NET : Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

UNIT V **12 Hrs**

CLR And .Net Framework : Assemblies, Versioning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

Total no. of Hrs : 60

REFERENCES:

1. Balagurusamy E(2004) *Programming in C#*- Tata McGraw-Hill.
2. Liberty J (2002) ,*Programming in C(*2nd ed.),O Reilly.
3. Herbert Schildt(2004) *The complete Reference:C#*-,Tata McGraw-Hill.
4. Robinson et al(2002*), Professional C#*(2nd ed.), Wwrox press.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19G014 OPEN SOURCE SOFTWARE 3 1 0 4

OBJECTIVES:

- To impart knowledge to make the students
- To understand the basics of open source software
- To create dynamic web applications using PHP- MySQL and AJAX

UNIT I **12 Hrs**

Introduction to Open Source: Overview of free/ open source software - history – advantages – disadvantages – Open Source business models– Open Source Licenses - types – Free/ Open source software examples

UNIT II **12 Hrs**

Basics of PHP Programming: PHP Programming: Introduction – Syntax – Variables - Controls and functions – Strings -Arrays: Using Arrays- Manipulating Arrays- Associative Arrays – Advanced Array Functions

UNIT III **12 Hrs**

Object Oriented Programming with PHP: Object-Oriented Programming with PHP – Strings and Regular Expression Functions – File system and System Functions – Sessions- Cookies and HTTP

UNIT IV **12 Hrs**

PHP and MySQL: MySQL Database Administration – PHP/MySQL Functions – Displaying Queries in Tables – Building Forms from Queries

UNIT V **12 Hrs**

PHP and AJAX: PHP and AJAX - introduction – JavaScript and AJAX Client: JavaScript and DOM – XMLHttpRequest Object – AJAX form validation

Total no. of Hrs : 60

REFERENCES:

1. Dan Woods & GautamGuliani (2005)*Open Source for the Enterprise*, PHP.
2. BogdanBrinzarea, lamandi CristianDarie and Audra Hendrix- (2009),*AJAX and PHP*, Packt Publishing..
3. Joseph Feller, Brain Fitzgerald & Eric S. Raymond (2001), *Understanding Open Source Software Development*(1st ed.), Addison -Wesley Professional.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19G015 ENTERPRENEURSHIP DEVELOPMENT 3 1 0 4

OBJECTIVES:

- To impart basis managerial knowledge and understanding
- To develop and strengthen entrepreneurial quality and motivation
- To develop small and medium enterprises sector which is necessary for employment generation and wider dispersal of industrial ownership

UNIT I **12 Hrs**

Entrepreneur: Meaning – Definition – Nature and Importance of Entrepreneur – Classification of Entrepreneurs - Characteristics and Qualities of Entrepreneur - Role of Entrepreneurs in the economic development – Factors affecting entrepreneurial growth.

UNIT II **12 Hrs**

Entrepreneurship: Concept – Distinction between Entrepreneur and Entrepreneurship - Entrepreneurship Development Programs (EDP): Meaning and Need of EDP – Role of EDP – Significance of EDP - Stages in EDP- Role of Government in Organizing EDP.

UNIT III **12 Hrs**

Establishing a Small Enterprise: Process of setting a New Business – Problems of New Venture – Selection of Viable Project – Project Development and Selection – Preparation of Project Report – Project Appraisal – Business Location – Legal Requirements – Legal Requirements of Establishing a New Unit - Steps to start an industrial unit

UNIT IV **12 Hrs**

Incentives and Subsidies: State and Central Govt. – Aims – Backward Areas – Industrial Estates –Role of DIC-SISI- TCO in Entrepreneurial Growth.

UNIT V **12 Hrs**

Growth of Entrepreneurial Venture: Importance of Strategic Planning for Emerging Ventures – Entrepreneurial Growth - Concept and Management – Raising funds for New Venture – Role and Significance of Venture Capital – Issues and Challenges of Family Owned Business

Total No of Hrs : 60

REFERENCES:

1. Sangeetha Sharma(2016), *Entrepreneurship Development*, PHI Learning Pvt Limited.
2. *Guide to Entrepreneurs Industrial Development* , Govt. of Tamil Nadu, SIPCOT
3. Singh P N(1986) , *Developing Entrepreneurship for Economic Growth*.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GL05 C # and .NET PROGRAMMING LABORATORY 0 0 4 2

OBJECTIVES:

- Understand, analyze and use language interfaces and inheritance.
- Familiar with using .NET collections (sets- lists- dictionaries).
- Understand ,analyze and use exceptions- Windows Forms- .NET Remoting and Serialization.
- Build interactive web applications using ASP.NET and C#.

1)Write a program to implement multilevel inheritance. Accept and display data for one student.

Class : student Data Members : Roll_no , name

Class : Test Data Members : marks1 , marks2

Class : Result Data Members : total

2)Consider the Database STUDENT consisting of following tables:

tbl_Course (CourseID:int, CourseName: string)

tbl_Student (USN: string, StudName: string, Address: string,CourseID: int, YrOfAdmsn: int) Develop suitable windows application using C#.NET having following options:

a)Entering new course details.
b)Entering new student details.
c)Display the details of students (in a Grid) who belong to a particular course.
d)Display the details the students who have taken admission in a particular year.

3) Create the application using ASP.NET Server controls that accepts name, password ,age , email id, and user id. All the information entry is compulsory. Password should be reconfirmed. Age should be within 21 to 30. Email id should be valid. User id should have at least a capital letter and digit as well as length should be between 7 and 20 characters.

4) Create a web application to insert 3 records inside the SQL database table having following fields(DeptId, DeptName, EmpName, Salary). Update the salary for any one employee and increment it to 15% of the present salary. Perform delete operation on 1 row of the database table.

5)Consider the Database STUDENT consisting of following tables:

tbl_Course (CourseID:int, CourseName: string)

tbl_Book (BookID :int, BookTitle: string, Author: string, CourseID: int)

tbl_Student (USN: string, StudName: string, CourseID: int)

tbl_BookIssue(USN: string, BookID: int, IssueDate: Date)

Develop suitable windows application using C#.NET having following options:

a) New Course Entry
b) New Book Entry,
c) New Student Entry
d) Issue of books to a student
e) Generate report (display in a grid) showing all the books belonging to particular course
f) Generate report (display in a grid) showing all the books issued on a particular date
g) Generate report (display in a grid) showing all the books issued to a particular student.

6.Develop a Web Application using C#.NET and ASP.NET for a Bank. The BANK Database should consist of following tables:

a)tbl_Bank (BankID: int, BankName: string)

b)tbl_Branch (BranchID: int, BankID: int, BranchName: string)
c)tbl_Account (AccountNo:int, BankID: int, BranchID: int, CustomerName: string, Address: string, ContactNo: int, Balance: real)
(Note: AccountNo and BankID together is a composite primary key).

The master page of this web application should contain hyperlinks to New Bank Entry, New Branch Entry (of selected Bank), New Customer Entry (based on branch and bank) and Report Generation.

The hyperlinks should navigate to respective content pages. These content pages provide the fields for respective data entry. The reports should be generated (display in grid) as below:

a. Display all records of particular bank.
b. Display all records of a branch of particular bank.
c. The balance should be displayed for the entered account number (Bank and Branch are input through ComboBox controls and Account number is input through TextBox).

7.Write a Program using Language Integrated query. Create the table with the given fields.

FIELD NAME	DATA TYPE
SRollno	int
SName	string
SAddress	string
SFees	int

Total No. of Hours needed to Complete the Lab : 30

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GE01 INTERNET OF THINGS AND WIRELESS SENSOR NETWORKS 3 1 0 4

OBJECTIVES:

- To understand the concepts of micro controller
- To apply IoT Applications for specific domains
- To understand the Programming Fundamentals with C using Arduino

UNIT I

Introduction and definition to IOT - What is an IOT? - Explore the scenario for application of IOT Communication definitions Concepts - Capturing and Storing the data - What to do with the data…applying Expert Systems and Machine Learning; IOT Detailed understanding of Solution Architecture - IOT Device Architecture - IOT Network/Communication Architecture with an understanding on client server and looselycouple storage servers and message queues - IOT Application Architecture.

UNIT II

Programming Fundamentals with C using Arduino IDE - Understanding the Arduino IDE - Installing and Setting up the Arduino IDE - Connecting the Arduino IDE with devices - Program Structure in C - Basic Syntax - Data Types / Variables / Constants - Operators, Conditional Statements and Loops -Functions , Array and Pointers - Strings and I/O -Using Arduino C Library functions for Serial, delay and other invoking functions - Working with LED and Switch example on Arduino C Library functions

UNIT III

Working with Arduino for data acquisition with IOT Devices - Understanding Sensors and Devices - Understanding basic electronic components and power elements - Understanding the Inputs from Sensors - Working with Temperature Sensors -Working with Ultrasound Sensor -Working with humidity sensor - Working with Motion Sensor - Working with IR Sensor - Working with Proximity Sensor - Working with Photo Diode - Working with Accelerometer and vibration sensor - Measuring Voltage and Current

UNIT IV

Working with Arduino for data acquisition with IOT Devices - Understanding the Outputs - Activating LED Lights - Activating Relays - Activating Buzzer - Running DC Motors - Running - Stepper Motors and Servo Motors

UNIT V

Programming Fundamentals with Web Applications for handling Data Communication from IOT Device - Understanding the data capture through web services - Creating and Programming a rest
web service with ASP.NET / PHP - Calling and accessing the Web Service in a Client; Building and Using Communication Devices to data transfer from IOT Devices - Understanding the Communication Principles to Transfer the data from IOT Devices; Remote Communication to cloud/external application - Using WIFI to Transfer the data from IOT Sensor.

REFERENCES:

1. Michael Margolis(2011), *Arduino Cookbook*(2nd ed.), O'Reilly Media.
2. Michael Collier, Robin Shahan(2015), *Fundamentals of Azure*, Microsoft Press.

MCA19GE02 **GRID AND CLOUD COMPUTING** **3 1 0 4**

OBJECTIVES:

- To understand the Grid and Cloud Systems Design, architecture, data and resource management.

UNIT I

Introduction to Parallel and Distributed Computing - Cluster Computing - Grid Computing- Cloud Computing - Anatomy and Physiology of Grid- Web and Grid Services - Grid Standards - OGSAWSRF - Resource sharing - Trends, Challenges and Applications.

UNIT II

Open Grid Services Architecture (OGSA)-OGSI-OGSA use cases: Commercial data center (CDC), National Fusion collaboratory (NFS), Online media and entertainment – OGSA platform components - OGSA basic services - Policy Architecture- Security Architecture

UNIT III

Resource management on the Grid - Grid resource management systems- Work management-Layers of Grid computing. Globus GT3 Toolkit: GT3 Software Architecture model- Resource allocation- Resource management and Data management services.

UNIT IV

Cloud Architecture and Model: Technologies for Network-Based System – System Models for Distributed and Cloud Computing. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand – Security in cloud.

UNIT V

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

REFERENCES:

1. Joshy Joseph & Craig Fellenstein (2009) , *Grid Computing*, IBM Press, Pearson Education, Indian Reprint.
2. Ian Foster & Carl Kesselman(2004), *The Grid 2: Blueprint for a New Computing Infrastructure*(2nd ed), Morgan Kaufmann Publishers.

MCA19GE03 DATA ANALYSIS AND BUSINESS INTELLIGENCE 3 1 0 4

OBJECTIVES:

- To understand the Data Analytic concepts, tools and analysis of data using the tools.

UNIT I

Data warehousing: Introduction – Definition – Multidimensional data model – OLAP operations – Warehouse schema – Data warehousing architecture – Warehouse server – Meta data – OLAP Engine – Data warehouse backend process – Cloud data warehousing - Other features

UNIT II

Data analytics: Statistical data analysis – Fact based decision making using statistical data analysis – Descriptive model – Predictive model - Analyze and predict results based on historical patterns-Apply statistical methods to economic data, problems and trends

UNIT III

Statistics for Data Engineers: Mean, Median, Variance, Standard Deviation –Regression-Correlation Test: Chi square, Spearman Rank correlation, Pearson correlation coefficient – Parametric Test: period sample t-test, Two Independent t-test, One sample t-test – Non Parametric Test: The wilcoxon rank sum text and mannwhileny test, wilcoxon signed-ranked test

UNIT IV

Business Intelligence: Introduction – Need for BI – Related Areas - Data Preprocessing – Visualization - Variable reduction, Principle components, Course of Dimensionality – Business Intelligence model - Design Business Intelligence model and conducting the analysis

UNIT V

Tools for BI: (Any one tool in depth) Tools Overview – Tools: Cognos, Business Object, Intelligent Miner, Siebel, BI Tool, Oracle Miner, SAS.

REFERENCES:

1. The Data Warehouse ETL Toolkit: Practical Techniques for Extracting, Cleaning, Ralph Kimball, Joe Casertra
2. Successful Business Intelligence: Secrets to Making BI a Killer App , By CindiHowson

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MCA19GE04 **IMAGE PROCESSING** **3 1 0 4**

OBJECTIVES:

- To understood the Image processing.
- To understood the image enhancement, image filtering and restoration

UNIT I **12 Hrs**

Introduction: Fundamental Steps in Image processing – Elements – Digital Image Fundamentals – Image representation – Modeling – Image enhancement – Image restoration – Image analysis – Image reconstruction from projections – Image data compression – Two-Dimensional Systems and Mathematical Preliminaries: Notation and definitions – Discrete and Fast Fourier Transform

UNIT II **12 Hrs**

Image Enhancement: Point operations – Enhancement by point processing – Histogram modeling – Spatial operations – Enhancement in Frequency Domain – Transform operations – Multispectral Image Enhancement – Color Image Enhancement

UNIT III **12 Hrs**

Image Filtering and Restoration: Degradation model – Diagonalization of circulant and block circulant matrices - Algebriac approach to restoration – Inverse and Wiener filtering – Finite impulse response Wiener filters – Other Fourier Transform Filters – Smoothing splines and Interpolation – Least square filters – Recursive and semirecursive filtering – Maximum entropy restoration – Bayesian methods – Coordinate transformation and Geometric correction – Blind deconvolution – Extrapolation of band-limited signals

UNIT IV **12 Hrs**

Image Data compression: Fundamentals – Image compression models – Elements of information theory – Pixel coding – Predictive techniques – Transform coding theory – Transform coding of images – Hybrid coding and vector DPCM – Inter frame coding – Image coding in the presence of channel errors – Coding of two tone images – color and multi-spectral Image coding – Lossless and lossy compressions - standards

UNIT V **12 Hrs**

Image Segmentation – Representation and Description – Recognition – Interpretation – Image analysis and Computer vision – Image reconstruction from Projections – Artificial Neural networks for color classification - Realization for real time processing – Three-dimensional Filters

Total no. of Hrs : 60

REFERENCE:

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, Second Edition, Prentice-Hall of India Private Limited, New Delhi, 1995.

2. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Addison-Wesley Publishing Company, Newyark, Third edition, 2008

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MCA16GE05 **SOFT COMPUTING** **3 1 0 4**

OBJECTIVES:
- To learn the key aspects of Soft computing
- To know about the components and building block hypothesis of Genetic algorithm.
- To understand the features of neural network and its applications
- To study the fuzzy logic components
- To gain insight onto Neuro Fuzzy modeling and control.
- To gain knowledge in machine learning through Support vector machines.

UNIT I INTRODUCTION TO SOFT COMPUTING **12 Hrs**

Evolution of Computing - Soft Computing Constituents – From Conventional AI to ComputationalIntelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS **12 Hrs**

Introduction, Building block hypothesis, working principle, Basic operators and Terminologies likeindividual, gene, encoding, fitness function and reproduction, Genetic modeling: Significance ofGenetic operators, Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwiseoperator, GA optimization problems, JSPP (Job Shop Scheduling Problem), TSP (TravellingSalesman Problem),Differences & similarities between GA & other traditional methods, Applications of GA.

UNIT III NEURAL NETWORKS **12 Hrs**

Machine Learning using Neural Network, Adaptive Networks – Feed Forward Networks– Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning– Unsupervised Learning Neural Networks – Adaptive Resonance Architectures – Advances in NeuralNetworks.

UNIT IV FUZZY LOGIC **12 Hrs**

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules andFuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT V NEURO-FUZZY MODELING **12 Hrs**

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification andRegression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-FuzzyControl – Case Studies.

Total no. of Hrs : 60

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani(2003), *Neuro-Fuzzy and Soft Computing*, Prentice-Hall of India.
2. Kwang H.Lee(2005), *First course on Fuzzy Theory and Applications*, Springer–Verlag Berlin Heidelberg.
3. George J. Klir & Bo Yuan(1995),*Fuzzy Sets and Fuzzy Logic-Theory and Applications*, Prentice Hall.
4. James A. Freeman and David M. Skapura(2003), *Neural Networks Algorithms, Applications, and Programming Techniques*, Pearson Edn.
5. David E. Goldberg(2007), *Genetic Algorithms in Search, Optimization and Machine Learning*, Addison Wesley..
6. Mitsuo Gen & RunweiCheng(2000),*Genetic Algorithms and Engineering Optimization*, Wiley Publishers.

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MCA16GE06 SEMANTIC WEB 3 1 0 4

OBJECTIVES:

- To understand the need of semantic web in web services
- To know the methods to discover, classify and build ontology for more reasonable results in searching
- To build and implement a small ontology that is semantically descriptive of chosen problem domain
- To implement applications that can access, use and manipulate the ontology

UNIT I INTRODUCTION 12 Hrs

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual andsyntactic web – Levels of Semantics – Metadata for web information - The semantic web architectureand technologies – Contrasting Semantic with Conventional Technologies –Semantic Modeling -Potential of semantic web solutions and challenges of adoption

UNIT II ONTOLOGICAL ENGINEERING 12 Hrs

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts,terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions –Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building –Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Developmentprocess and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning

UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES 12 Hrs

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying –Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS –basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns-Transitivity

UNIT IV WEB ONTOLOGY LANGUAGE 12 Hrs

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain andRange – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions –Advanced Class Description – Equivalence – Owl Logic.

UNIT V SEMANTIC WEB TOOLS AND APPLICATIONS 12 Hrs

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web -Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data -Ontological representation of social relationships, Aggregating and reasoning with social network data

Total no. of Hrs : 60

REFERENCES:

1. Liyang Yu(2011), *A Developer's Guide to the Semantic Web*(1st ed.), Springer.
2. John Hebeler, Matthew Fisher, Ryan Blace & Andrew Perez-Lopez(2009), *Semantic Web Programming*(1st ed.) ,Wiley.
3. Grigoris Antoniou & Frank van Harmelen(2008), *A Semantic Web Primer*(2nd ed.), MIT Press.
4. Dean Allemang & James Hendler(2011), *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL*(2nd ed.), Morgan Kaufmann.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE07 SERVICE ORIENTED ARCHITECTURE 3 1 0 4

OBJECTIVES:

- To provide fundamental concepts of Service Oriented Architecture..
- To gain knowledge about SOAP, UDDI and XML to create web services.
- To know about the Cloud Computing architecture and services.

UNIT I SOABASICS 12 Hrs

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributedinternet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation – Service Layers.

UNIT II XML AND WEB SERVICES 12 Hrs

XML structure – Elements – Creating Well-formed XML - Name Spaces – Schema Elements, Types,Attributes – XSL Transformations – Parser –Web Services Overview – Architecture.

UNIT III WSDL, SOAP and UDDI 12 Hrs

WSDL - Overview Of SOAP – HTTP – XML-RPC – SOAP: Protocol – Message Structure –Intermediaries – Actors – Design Patterns And Faults – SOAPWith Attachments – UDDI.

UNIT IV SOA in J2EE and .NET 12 Hrs

SOA platform basics – SOA support in J2EE – Java API for XML-based web services(JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries(JAXR) - Java API for XML based RPC (JAX-RPC) – JAX-RS SOA support in .NET – ASP.NET webservices.

UNIT V CLOUD COMPUTING 12 Hrs

Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloudcomputing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.

Total no. of Hrs : 60

REFERENCES:

1. Thomas Erl(2006), *Service-Oriented Architecture: Concepts, Technology, and Design*, Pearson Education.
2. HeatherWilliamson(2015), *XML, The Complete Reference*, McGraw Hill Education.
3. Frank. P. Coyle(2002), *XML, Web Services And The Data Revolution*, Pearson Education.
4. Sandeep Chatterjee & James Webber(2005), *Developing Enterprise Web Services. An Architect's Guide*, Pearson Education.
5. Newcomer & Lomow(2005), *Understanding SOA with Web Services*, Pearson Education.
6. Dan woods & Thomas Mattern(2006), *Enterprise SOA designing IT for Business Innovation*(1st ed.), O'REILLY.
7. RajkumarBuyya , Christian Vecchiola & ThamaraiSelvi, S(2013), *Mastering Cloud Computing*, McGraw Hill Education.

MCA19GE08 PROGRESSIVE WEB APPLICATION DEVELOPMENT 3 1 0 4

UNIT I **12 Hrs**

PWA and Angular 2 -What is a Progressive Web App (PWA)? - Features of Progressive Web App (PWA) - Different PWA Platforms; What is Angular 2 - Angular 2 Architecture - Angular 2 features; Install Node.js server - Install Git hub - Install Typescript - Install Angular 2 - Install Angular CLI; Working with Angular CLI features - Creating an Angular Project - Creating component - Creating a module - Creating a service - Creating pipes - Creating directive - Creating Enum

UNIT II **12 Hrs**

Components : What is a Component made of? - Working with the component HTML and Style Sheet - Working with component type script code - Understanding typescript basics - Adding the component to the module; Understanding and working with flex layout - Installing the Flex Layout - Building and working with different Layouts; Install and implement Angular Material components - Adding a Material UI component to angular component - Working with Angular Material UI Elements - Working with Material icons

UNIT III **12 Hrs**

Events -How are events implemented in angular code? - Understanding component life cycle events - Responding to common component UI events; Understanding the structure of the component class - Defining the properties and variables - Understanding Data binding - Defining the methods - Defining and understanding @Input - Defining and understating the @Output

UNIT IV **12 Hrs**

Understanding Directives - Working with ngIf - Working with ngFor - Understanding Pipes - Implementing a simple pipe for a date substitution - Creating custom Pipes; Understanding Navigation in Angular 2 - How is router enabled? - Understanding the base routing? - Working with router outlet - Understanding router events; What is MVC/ Web API? - How to create an MVC application with Microsoft Visual Studio? - How to create an entity to show json output? - Creating and running the MVC Service

UNIT V **12 Hrs**

Understanding HTTP Service - Understanding and Working with Dependency Injection - Calling an MVC Service with HTTP Service - Handling Json Data from MVC and binding the data; How is code reusability ensured in Angular 2? - Building custom services - Building module to integrate component - Building components into parents to facilitate interaction; How to build custom service? - How to add the service to a module? - Calling a service inside a component; Understanding web hosting? - Understanding angular build environment - How to build the production code? - Deployment of the production code to web site

Total no. of Hrs : 60

REFERENCES:

1. Jake Spurlock, „Bootstrap", O"Reilly Media, 2013
2. Alex Pop, „Learning AngularJS for .NET Developers", Packt Publishing Ltd., 2014.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GE09 DATA VISUALIZATION 3 1 0 4

OBJECTIVES:

- To understand how accurately represent voluminous complex data set in web and from other data sources
- To understand the methodologies used to visualize large data sets

UNIT I **12 Hrs**

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools. visualizing data methods - Mapping - Time series - Connections and correlations - Scatter plot maps - Trees, Hierarchies and Recursion - Networks and Graphs, Info graphics.

UNIT II **12Hrs**

INTERACTIVE DATA VISUALIZATION:Introduction to D3 - Fundamental Technology - Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geomapping – Exporting- Data to create Visualizationwith SVG - SVG – Styling CSS – Shapes – SVG Properties – SVG Text - Drawing – Transformations – Building Chart with SVG (Scalable Vector Graphics) - Shaping Web Pages – Selections – Attributes – Chaining Methods –Data Joins - Sizing – scales – axes – Loading – Filtering – Interactive Charts – Buttons using Data Join – Transition using Key

UNIT III **12 Hrs**

D3-BASED REUSABLE CHART LIBRARY: Introduction to D3 – Setup and Deployment – Generate Chart – Customize Chart – How to Use APIs – Customize Style – Building Real time and Live Updating animated graphs with C3.

UNIT IV **12 Hrs**

TABLEAUE INTRODUCTION:Environment Setup – Navigation – File & Data Types. **DATA SOURCE:** Custom Data View – Extracting Data – Fields Operations – Editing Meta Data – Data Joining – Data Blending. Worksheets

UNIT V **12 Hrs**

TABLEAUE CHARTS: Bar Chart – Line Chart – Pie Chart – Scatter Plot – Bubble Chart –Gantt Chart – Histograms - Waterfall Charts. ADVANCED: Dashboard – Formatting – Forecasting – Trend Lines

Total no. of Hrs : 60

REFERENCES

1. Ben Fry, (2007) "Visualizing Data", O'Reilly Media, Inc.,
2. Ritchie S. King - *Visual Storytelling with D3 – An Introduction to Data Visualization with D3,* Addison-Wesley, ISBN 10: 0321933176
3. Elijah Meeks (2017*), Data visualization with JavaScript*(2nd ed.), Manning Publications, ISBN: 9781617294488

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GE10 EMBEDDED SYSTEMS 3 1 0 4

OBJECTIVES:

- To understand the architecture of embedded processors, microcontrollers, and peripheral devices.
- To understand the challenges in developing operating systems for embedded systems.
- To learn about programming these systems in high-level languages such as C.

UNIT I **12 Hrs**

Embedded Computing: Challenges of Embedded Systems – Embedded system design process. Embedded processors – 8051 Microcontroller- ARM processor – Architecture - Instruction sets and programming.

UNIT II **12 Hrs**

Memory And Input / Output Management : Programming Input and Output – Memory system mechanisms – Memory and I/O devices and interfacing – Interrupt handling.

UNIT III **12 Hrs**

Processes And Operating Systems: Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Performance issues.

UNIT IV **12 Hrs**

Embedded C Programming : Programming embedded systems in C – C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

UNIT II **12 Hrs**

Embedded System Development :Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Introduction to Internet of Things - Design issues – Design methodologies – Case studies using IoT– Complete design of example systems.

Total no. of Hrs : 60

REFERENCES:

1. Andrew N Sloss, D. Symes, C. Wright(2006), "*ARM System Developers Guide*", Morgan Kauffman/ Elsevier (unit 4).

2. Arshdeep Bahga, Vijay Madisetti(2015), "*Internet of Things – A hands-on approach*", Universities Press.

5. Michael J. Pont(2007), "*Embedded C*", Pearson Education.

6. Steve Heath(2005), "*Embedded System Design*", Elsevier.

7. Wayne Wolf(2006), "*Computers as Components:Principles of Embedded Computer System Design*", Elsevier.

MCA19GE11 **BIG DATA ANALYTICS** **3 1 0 4**

OBJECTIVES:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques
- To understand the various search methods and visualization techniques.
- To understand the applications using Map Reduce Concepts

UNIT I **12 Hrs**

Introduction To Big Data : Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference

UNIT II **12 Hrs**

Mining Data Streams : Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – EstimatingMoments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP)Applications – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT III **12 Hrs**

Hadoop Environment : History of Hadoop- The Hadoop Distributed File System – Components of HadoopAnalyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Hadoop filesystems-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features

UNIT IV **12 Hrs**

Data Analysis Sytems And Visualization : Link Analysis – PageRank - Efficient Computation of PageRank-Topic-Sensitive PageRank – Link Spam- Recommendation Systems- A Model for Recommendation Systems-ContentBased Recommendations - Collaborative Filtering- Dimensionality Reduction

UNIT V **12 Hrs**

Frameworks And Applications: IBM for Big Data –Framework - Hive – Sharding – NoSQL Databases –Mango DB-CasandraHbase – Impala – Analyzing big data with twitter – Big data for Ecommerce – Big data for blogs.

Total no. of Hrs : 60

REFERENCES:

1. AnandRajaraman & Jeffrey David Ullman(2014), "*Mining of Massive Datasets*", CambridgeUniversity Press.
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapi & Paul Zikopoulos(2012), "*Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data*", McGrawHill Publishing.
3. Franks(2012), "*Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith Advanced Analytics*", John Wiley & sons.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA19GE12 SOFTWARE PROJECT MANAGEMNET 3 1 0 4

OBJECTIVES:

- To know of how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT I 12Hrs

Software Project Management Concepts: Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- TQM, Six Sigma

UNIT II 12 Hrs

Software Evaluation And Costing : Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting - cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach - Choosing technologies, choice of process models, structured methods.

UNIT III 12 Hrs

Software Estimation Techniques: Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques - expert Judgment, Estimating by analogy. Activity Planning - Project schedules, projects and activities - sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT IV 12 Hrs

Risk Management: Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT I 12 Hrs

Globalization Issues In Project Management : Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management

Total no. of Hrs : 60

REFERENCES:

1. Bob Hughes & Mike Cotterell(2012), *Software Project Management* (5th ed.), Tata McGraw- Hill Publications.

2. Futrell(2008), *Quality Software Project Management*, Pearson Education India.

3. Gobalswamy Ramesh(2003), *Managing Global Software Projects*, Tata McGraw Hill Publishing Company.

4. Richard H.Thayer "Software Engineering Project Management", IEEE Computer Society

MCA19GE13 SECURITY IN COMPUTING 3 1 0 4

OBJECTIVES:

- To understand the basics of cryptography
- learn to find the vulnerabilities in programs and to overcome them,
- know the different kinds of security threats in databases and solutions available
- learn about the models and standards for security

UNIT I 12Hrs

Elementary Cryptography: Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures.

UNIT II 12Hrs

Program Security: Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Flaws

UNIT III 12Hrs

Security In Networks : Threats in networks – Virtual Private Networks – PKI – SSL – IPSec – Content Integrity – Access Controls – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT IV 12Hrs

Security In Databases: Security requirements of database systems – Reliability and Integrity in databases – Redundancy – Recovery – Concurrency/ Consistency – Monitors – Sensitive Data – Types of disclosures – Inference-finding and confirming sql injection.

UNIT V 12Hrs

Security Models And Standards : Secure SDLC – Security architecture models – Bell-La Padula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Security Standards

Total no. of Hrs : 60

REFERENCES:

1. Education Charles P. Pfleeger & Shari Lawrence Pfleeger(2007), *Security in Computing*(4th ed.), Pearson

2. Michael Whitman & Herbert J. Mattord(2010), *Management of Information Security*(3rd ed.).

3. Michael Howard, David LeBlanc & John Viega(2009), *24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them*(1st ed.), Mc GrawHill Osborne Media.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE14 GAME PROGRAMMING 3 1 0 4

OBJECTIVES:

- To understand of game design and development
- To understand the processes, mechanics, issues in game design, game engine development
- To understand modeling, techniques, handling situations, and logic.

UNIT I **12Hrs**

3d Graphics For Game Programming - Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization,Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves andSurfaces, Shader Models, Image Texturing, Bump Mapping,Advanced Texturing, Character Animation,Physics-based Simulation

UNIT II **12Hrs**

Game Design Principles - Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

UNIT III **12Hrs**

Gaming Engine Design - Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT IV **12Hrs**

Gaming Platforms And Frameworks - Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity

UNIT V **12Hrs**

Game Development - Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

Total no.of.Hrs :60

REFERENCES:

1. David H. Eberly(2006), *3D Game Engine DesignA Practical Approach to Real-Time Computer Graphics*(2nd ed.), Morgan Kaufmann.
2. JungHyunHan(2011), *3D Graphics for Game Programming*(1st ed.).
3. Mike McShaffrfy(2009),*Game Coding Complete*(3rd), Charles River Media.
4. Jonathan S. Harbour(2009), *Beginning Game Programming*(3rd ed.), Course Technology PTR.
5. Ernest Adams & Andrew Rollings(2006), *Fundamentals of Game Design*(1st ed.), Prentice Hall.
6. Roger E. Pedersen(2009), *Game Design Foundations*(2nd ed.) ,Jones & Bartlett Learning.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE15 DISTRIBUTED SYSTEMS 3 1 0 4

OBJECTIVES:

- To expose students to both the abstraction and details of file systems.
- To introduce concepts related to distributed computing systems.
- To focus on performance and flexibility issues related to systems

UNIT I **12Hrs**

Introduction-Definition of a Distributed system-Goals- Types of Distributed system –Architectures-Architectural Styles-System Architectures –Architecture Versus middleware-Self management in Distributed systems.

UNIT II **12Hrs**

Processes- Threads- Virtualization- Clients- Servers- Code migration-Communication-Fundamentals- Remote Procedure Call- Communication-Message – Stream – Multicast- Naming-Names, Identifiers and Addresses-Naming -Flat - Structured - Attributed based.

UNIT III **12Hrs**

Synchronization-Clock synchronization-Local clocks-Mutual Exclusion-Global positioning of nodes-Election Algorithm-Consistency and Replication-Data-Centric consistency models- Replica management-Consistency protocols.

UNIT IV **12Hrs**

Fault Tolerance -Process Resilience-Reliable Client- Server Communication- Distributed Commit- Recovery-Security-Secure Channels- Access control- Security Management.

UNIT V **12Hrs**

Distributed Systems-Distributed Object-based Systems- File Systems –Web based Systems –Coordination- based Systems.

Total no. of Hrs : 60

REFERENCES:

1. Andrew S. Tanenbaum & Maarten Van Steen(2007), *Distributed System-Principles and Paradigms*(2nd Ed), Pearson Education.
2. George Coulouris, Jean Dollimore& Tim Kindberg(2002), *Distributed Systems Concepts and Design*, (3rded), Pearson Education.
3. HagitAttiya& Jennifer Welch(2004),*Distributed Computing: Fundamentals, Simulations and Advanced Topics*, Wiley.
4. MukeshSinghal(1994), *Advanced Concepts In Operating Systems*", McGrawHill.
5. Tanenbaum & Van Steen,M(2004),*Distributed Systems*, Pearson Education.
6. Liu,M,L(2004),*Distributed Computing Principles and Applications*, Pearson Addison Wesley.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE16 KNOWLEDGE MANAGEMENENT 3 1 0 4

OBJECTIVES:

- To understand knowledge management and its life cycle
- To know the capturing knowledge and fuzzy reasoning
- To learn about the various modes of knowledge conversion

UNIT I **12Hrs**

Knowledge management - KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge - intelligence – Experience – Common Sense – Cognition and KM – Types Of Knowledge – Expert Knowledge – Human thinking and learning

UNIT II **12Hrs**

Knowledge management system life cycle - Challenges in Building KM Systems – Conventional Vs KM System Life Cycle (KMSLS) - Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation- Knowledge Architecture

UNIT III **12Hrs**

Capturing knowledge - Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol Analysis – Consensus Decision Making – Repertory Grid- Concept Mapping –Blackboarding

UNIT IV **12Hrs**

Knowledge codification - Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing – Approaches to Logical Testing, User Acceptance Testing – KM , System deployment issues – user training – post implementation

UNIT V **12Hrs**

Knowledge transfer and sharing - Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing , Knowledge workers

Total no. of Hrs : 60

REFERENCES:

1. Elias.M. Award & Hassan M. Ghaziri (2000) ,*Knowledge Management,* Pearson Eduction.
2. Holsapple,C,W (2003) *Handbooks on Knowledge Management*, International Handbooks on Information Systems, Vol 1 and 2.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE17 **M -COMMERCE** **3 1 0 4**

OBJECTIVES:

- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications.
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application.

UNIT I **12Hrs**

Electronic Commerce - Introduction -The e-commerce environment - The e-commerce marketplace -Focus on portals,Location of trading in the marketplace - Commercial arrangement for transactions - Focus on auctions- Business models for e-commerce - Revenue models - Focus on internet start-up companies – the dot-com - E-commerce versus E business.

UNIT II **12Hrs**

Mobile Commerce - Introduction – Infrastructure Of M– Commerce – Types Of Mobile Commerce Services – TechnologiesOf Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non–Internet Applications In M– Commerce –Wireless/Wired Commerce Comparisons

UNIT III **12 Hrs**

Mobile Commerce Technology - A Framework For The Study Of Mobile Commerce – NTT Docomo's I–Mode – Wireless Devices ForMobilCommerce – Towards A Classification Framework For Mobile Location Based Services –Wireless Personal And Local Area Networks –The Impact Of Technology Advances On StrategyFormulation In Mobile Communications Networks

UNIT IV **12Hrs**

Mobile Commerce: Theory And Applications - The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services –Mobile Portal – Factors Influencing The Adoption Of Mobile Gaming Services – Mobile DataTechnologies And Small Business Adoption And Diffusion – M–Commerce In The Automotive Industry– Location– Based Services: Criteria For Adoption And Solution Deployment – The Role Of MobileAdvertising In Building A Brand – M– Commerce Business Models

UNIT V **12Hrs**

Business– To– Business Mobile E-Commerce - Enterprise Enablement – Email And Messaging – Field Force Automation (Insurance,RealEstate,Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking AndMaintenance/Management – Remote IT Support –Customer Retention (B2C Services, Financial,Special Deals) – Warehouse Automation – Security.

Total no. of Hrs :60

REFERENCES:

1. Dave Chaffey(2009), *E-Business and E-Commerce Management*(3rd ed.), PearsonEducation.
2. Brian E. Mennecke, Troy J. Strader(2003), *Mobile Commerce: Technology, Theory andApplications*, Idea Group Inc., IRM press.
3. Louis,P,J(2001), *M-Commerce Crash Course*, McGraw- Hill Companies.
4. Paul May(2001), *Mobile Commerce: Opportunities, Applications, and Technologies of WirelessBusiness*, Cambridge University Press.
5. Michael P. Papazoglou&Peter M.A. Ribbers(2009), *E-business organizational and Technical foundation* ',Wiley India.
6. Dr.Pandey& Saurabh Shukla(2011), *E-commerce and Mobile commerce Technologies* , Sultan Chand.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA16GE18 HEALTHCARE INFORMATION SYSTEMS 3 1 0 4

OBJECTIVES:

- To understand the basic concepts of health care system.
- To know about creating and maintaining health care information systems
- To ensure access of clinical information system on the fly
- To understand IT governance and assessment of health care information system

UNIT I **12Hrs**

Introduction- Introduction to health care information – Health care data quality – Health care informationregulations, laws and standards.

UNIT II **12Hrs**

Health Care Information Systems - History and evolution of health care information systems – Current and emerging use of clinical information systems – system acquisition – System implementation and support.

UNIT III **12Hrs**

Information Technology -Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.

UNIT IV **12Hrs**

Management of It Challenges - Organizing information technology services – IT alignment and strategic planning – IT governance and management.

UNIT V IT **12Hrs**

Initiatives - Management's role in major IT initiatives – Assessing and achieving value in health care information systems. Case study

Total no. of Hrs :60

REFERENCES:

1. Karen A Wager, Frances Wickham Lee &John P Glaser(2009), *Managing Health Care Information Systems: A Practical Approach for Health Care Executives*(2nd ed.), JohnWiley.
2. Marion J. Ball, Charlotte Weaver & Joan Kiel(2010) ,*Healthcare Information Management Systems: Cases, Strategies, and Solutions*(3rd ed.), Springer.
3. Rudi Van De Velde and Patrice Degoulet(2005), *Clinical Information Sytems: A Componenet based Approach*", Springer.
4. Kevin Beaver(2002), *Healthcare Information Systems*(2nd ed.),Best Practices, CRC Press.
5. Marion J. Ball(1995), *Healthcare Information Management Systems: A Practical Guide*, Springer-VerlagGmbH.