**Master of Computer Applications**

Syllabus

SCHOOL OF DISTANCE EDUCATION

**OPEN AND DISTANCE LEARNING**

**2023– 2024onwards**

**BHARATHIARUNIVERSITY**

**AStateUniversity,Accreditedwith“A++”Gradeby NAACRanked21stamongIndianUniversitiesby MHRD-NIRF**

**Coimbatore-641 046, TamilNadu,India**





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| **Program Educational Objectives (PEOs)** |
| The **M.C.A.** program describe accomplishments that graduates are expected to attain within five to seven years after graduation |
| To emerge as a System Analyst/ Software Engineer/ Data Analyst. |
| The students can come up with a good solution for Business Models |
| Design and Development of solutions to System Security |
| Emerge as a Good Teacherand Researcher. |



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| **Program Specific Outcomes (PSOs)** |
| After the successful completion of **MCA** program, the students are expected to |
| Obtain sound knowledge in the basic concepts of computer science including theory and programming familiar with relevant trends in computer science domains. |
| Integrate and apply efficiently the contemporary IT tools to all computer applications. |
| Acquire professional skills in software design process and practical competence in broad range of open source programming languages to withstand technological change and provide solutions to new ideas and innovations. |
| Able to pursue careers in IT industry/ consultancy/ research and development, teaching and allied areas related to computer applications. |
| Provide various computing skills like analysis, design and development of innovative software products to meet the industry needs with legal, ethical and social acceptable solutions for computer based technical problems. |



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| **Program Outcomes (POs)** |
| On successful completion of the **M.C.A.**program |
| Develop creativity and problem solving skills with the knowledge of computing and mathematics. |
| Ability to develop and carry out experiments, interpret and infer data. |
| Design algorithms and develop software to aid solutions to industry and governments. |
| Review the latest technology and tool handling mechanism. |
| Analyze the outcome to solve global environment related issues. |
| Apply the knowledge in lifelong learning journey to equip themselves. |
| Identify the perspective of business practices, risks and limitations. |
| Work with professional and ethical values. |
| Formulate the responsibilities of human rights and entrepreneurial spirit. |
| Understand the methods to communicate effectively and work collectively. |

**SCHOOL OF DISTANCE EDUCATION**

## BHARATHIAR UNIVERSITY, COIMBATORE-641 046

OPEN AND DISTANCE LEARNING PROGRAMME (ODL)

## Master of Computer ApplicationsCurriculum

*(Forthe studentsadmitted duringthe academicyear2023–24 onwards)*

**SCHEME OF EXAMINATIONS**

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| **Title of the Course** | **Credits** | **Maximum Marks** |
| **CIA** | **ESE** | **Total** |
| **FIRST SEMESTER** |  |  |  |  |
| Paper I : Java Programming | 4 | 25 | 75 | 100 |
| Paper II Relational Database Management Systems RDBMS | 4 | 25 | 75 | 100 |
| Paper III Computer Networks | 4 | 25 | 75 | 100 |
| Paper IV Operating Systems | 4 | 25 | 75 | 100 |
| Elective I: Artificial Intelligence and Expert System | 4 | 25 | 75 | 100 |
| Practical I : Java Programming Lab | 3 | 40 | 60 | 100 |
| Practical II : RDBMS with ORACLE Lab | 3 | 40 | 60 | 100 |
| **SECOND SEMESTER** |  |  |  |  |
| Paper V : Datamining and Big Data Analytics | 4 | 25 | 75 | 100 |
| Paper VI : .NET Programming | 4 | 25 | 75 | 100 |
| Paper VII : Operations Research | 4 | 25 | 75 | 100 |
| Paper VIII : Software ProjectManagement | 4 | 25 | 75 | 100 |
| Elective II: Mobile Computing | 4 | 25 | 75 | 100 |
| Practical III :DataminingLab | 3 | 40 | 60 | 100 |
| .Practical IV : NET Programming Lab | 3 | 40 | 60 | 100 |
| Practical V: Web Application Development and Hosting | 2 | 20 | 30 | 50 |
| **THIRD SEMESTER** |  |  |  |  |
| Paper IX : PHP Programming | 4 | 25 | 75 | 100 |
| Paper X : Software Testing | 4 | 25 | 75 | 100 |
| Paper XI :Network Security and Cryptography | 4 | 25 | 75 | 100 |
| Paper XII : Cloud Computing | 4 | 25 | 75 | 100 |
| Elective III | 4 | 25 | 75 | 100 |
| Practical VI : PHP Programming Lab | 3 | 40 | 60 | 100 |
| Practical VII : SoftwareTesting Lab | 3 | 40 | 60 | 100 |
| Practical VIII : Mini Project | 2 |  |  | \*100 |
| **FOURTH SEMESTER** |  |  |  |  |
| Major Project Work | 8 | 50 | **150** | \*200 |
| **Grand Total** | 90 |  |  | 2450 |

\* Project report - 80 marks; Viva-voce – 20 marks

\*\* Project report - 160 marks; Viva-voce – 40 marks # During II or III Semester(Optional)

Elective I ElectiveII

* 1. Artificial Intelligence andExpertSystems 2.1. WebServices
	2. Mobile Computing 2.2. MiddlewareTechnologies
	3. DistributedComputing 2.3. Information RetrievalTechniques
	4. EmbeddedSystems 2.4.Internet ofThings

Elective III

* 1. PythonProgramming
	2. Digital ImageProcessing
	3. NeuralNetworks
	4. Advancements in Industry4.0



First Semester



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| **Course code** | **JAVA PROGRAMMING** | **Core** |
| **Pre-requisite** | Basics of C and C++ Programming |
| **Course Objectives:** |
| The main objectives of this course are to enable the students:1. To understand basic concepts of object oriented programming, methods data types, class and objects, packages, interfaces andthreads.
2. To apply and analyze Java Concepts in Databases through JDBC,
3. To understand and apply Servlet technology RMI for a distributedarchitecture.
4. To enable the students to learn various exception handling mechanisms, Graphics and File functions.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basics of Java programming |
| Understand Java methods |
| Obtain knowledge about concepts, syntax and use of packages, interfaces, threads and exception handling for writing programs |
| Familiarize the JDBC object services and make use these services for database access programs |
| Apply multithreading, string manipulation, Java Beans and Servletsconcepts |
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| **Unit:1** | **INTRODUCTION** |
| Introduction: History of JAVA, JAVA class libraries – Basics of a typical JAVA environment – Arithmetic, Equality and Relational Operators – Thinking about Objects, Applet: Adding Integers (Example) – Control Structures: if, if/else, while, for, switch, do/while, break and continue – Operators: Assignment, Increment and Decrement and Logical – Primitive Data types.. |
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| **Unit:2** | **CLASS, METHODS AND PACKAGES** |
| Methods: program modules in JAVA – Methods – Method definitions – JAVA API packages – Duration of identifiers – Scope rules – Method overloading - Arrays – References and Reference parameters – Passing arrays to methods – Multiple subscripted arrays – Class scope – Controlling access to members – Creating packages – Constructors – Overloaded constructors – Set and Get methods – Final instance variables – Packages access – Using this reference – Finalizers – static Class members – Data abstraction and Information Hiding – Superclasses and Subclasses – protected members – Constructers and Finalizers in subclass – inner class definitions – Type wrapper class for primitive types. |



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| **Unit:3** | **STRING AND GRAPHICS** |
| String constructors – String methods: length, CharAt, getChars, hashCode, value of, intern and miscellaneous string methods – Substrings and concatenating strings – stringBuffer class – stringTokenizer Class – Graphics contexts and Graphics Objects – color and Font controls – Drawing lines, Rectangles, Ovals, Arcs, Polygons and Polylines - The JAVA2D API – Swing overview – Jlabel – Event handling model – JtexField, JpasswordField, Jbutton, JcheckBox, Jradio Button, JcomboBox, Jlist, JtextArea, Jslider – Mouse event handling, Adapter classes – Layout managers – Panels – Using menus with frames – Boxlayout manager. |
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| **Unit:4** | **EXCEPTION HANDLING AND FILES** |
| The basics of JAVA exception handling – Try blocks – Throwing, Catching and Rethrowing an exception – Throws clause – finally block – Class Thread: an overview – Thread states – Thread priorities and scheduling – Thread synchronization – Runnable interface – Thread groups – Loading, displaying and scaling images – Files and Streams – Creating, Reading and Updating a sequential access file – Creating, Writing and Reading a random access file – Class file – Reading, Inserting and Updating a database (Use JDBC to a MS Access) |
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| **Unit:5** | **SERVLET** |
| Overview of Servlet technology - Handling HTTP GET and POST requests – Session tracking – RMI: defining, implementing the RMI – Define the Client – Compile Execute the server and the client – Networking : Reading a file on a web server – Establishing a simple server and a simple client (using stream sockets) – Random and BitSet Class – Class arrays – Interface Collection and Class Collections – Sets – Maps – JAVABEANS : Preparing a class to be a JavaBean – Creating a JavaBean – Adding Beans and Properties to a JavaBean – Connecting Beans with Events in the BeanBox – the BeanInfo class. |
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| **Text Books** |
| 1 | Deitel and Deitel, “ Java How to Program”, Third Edition, PHI/Pearson Education Asia. |
| 2 | Keyurshab,“Java 2 programming”, Tata McGraw-Hill Pub. Company Ltd. |
| **Reference Books** |
| 1 | C.Xavier,“Programming with Java 2”,SciTech Publications (India) P. Ltd. |
| 2 | Cays S. Horstmann, Gary Cornell, “Core Java2 Volume I – Fundamentals”, Pearson Edition, 2001 5. Cays S. Horstmann, Gary Cornell, “Core Java2 Volume II – Fundamentals”, Pearson Edition, 2003 |
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| **Course code** | **RELATIONAL DATABASE MANAGEMENT SYSTEMS** | **Core** |
| **Pre-requisite** | Basic knowledge about database |
| **Course Objectives:** |
| The main objectives of this course are to:1. To enable the students to understand the basics of database management systems.
2. To enable the students to understand ER model, structure of relational database and indexing.
3. To enable the students to apply advance database concepts to create secured, distributed databases.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understood the basic principles of database management systems, parallel & distributed databases |
| Gained knowledge over various database models, schemas and SQL statements |
| Construct Logical database design |
| Apply normalization and functional dependency in database design with security concern |
| Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS |
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| **Unit:1** | **DATABASE SYSTEM** |
| Overview of database systems: Managing data- A historical perspective – File systems versus a DBMS - Advantages of a DBMS- Describing and storing Data in a DBMS - Queries in a DBMS- Transaction management – Structure of a DBMS. Database design & ER diagrams – Entities, Attributes, and Entity Sets – Relationships and Relationship Sets- Additional feature of the ER model- conceptual Database design with the ER model. |
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| **Unit:2** | **RELATIONAL MODEL** |
| Relational Model: Integrity constraints over relations – Enforcing integrity constraints – Querying relational data – Logical database design : ER to Relational –Introduction to Views – Destroying / Altering Tables & Views. Relational Algebra and Calculus: Relational Algebra – RelationalCalculus |
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| **Unit:3** | **SQL** |
| SQL: Queries, Programming, Triggers: The form of a basic SQL Query – UNION, INTERSECT and EXCEPT – Nested Queries – Aggregate operators – Null values –Complex integrity constraints in SQL - Triggers & Active data bases. Transaction Management |



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| Overview: The ACID Properties - Transactions & Schedules – Concurrent execution of Transactions – Lock-based concurrency control – Performance of Locking –Transaction support in SQL. |
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| **Unit:4** | **NORMAL FORMS AND SECURITY** |
| Schema Refinement and Normal forms: Introduction to Schema refinement – Functional dependencies – Reasoning about functional dependencies – Normal forms –Properties of Decompositions – Normalization – Schema Refinement in data base design – other kinds of dependencies. Security : Introduction to Database security -Access control – Discretionary Access control – Mandatory Access control – Additional issues to security. Concurrency control: 2PL, serializability and Recoverability – Introduction to Lock Management - Lock Conversions –Specialized Locking techniques - Concurrency control withoutlocking. |
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| **Unit:5** | **DISTRIBUTED DATABASE** |
| Parallel & Distributed databases: Introduction – Architecture for parallel databases – Parallel Query evaluation – Parallelizing individual operations –Parallel Query Optimization – Introduction to distributed Databases – Distributed DBMS architecture sorting data in a distributed DBMS. Object Database Systems: Motivation Example – Structured data types – Operation on structured data types – Encapsulation & ADTS – Inheritance - Objects, OIDS and Reference Types - Database design for and ORDBMS – OODBMS – Comparing RDBMS, OODBMS and ORDBMS. |
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| **Text Books** |
| 1 | Raghu Ramakrishnan, Johannes Gehrke –“Database Management Systems”, Third Edition, McGraw-Hill Higher Education. |
| 2 | Silberschatry, Korth, Sundarshan, “Database system Concepts”, Fourth Edition, McGraw- Hill Higher Education |
| **Reference Books** |
| 1 | Elmasri, Navathe, “Fundamentals of Database Systems”, Third Edition, Pearson Education Asia |
| 2 | S.S. Khandare, “Database Management and Oracle Programming”, First Edition, 2004, S.Chand and Company Ltd. 5. Nilesh Shah, “Database Systems using Oracle”, 2002, Prentice Hall of India. 6. Rajesh Narang, “Database Management Systems”, 2004, Prentice Hall of India |
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| **Course code** | **COMPUTER NETWORKS** | **Core** |
| **Pre-requisite** | Basics of Networks |
| **Course Objectives:** |
| The main objectives of this course are :1. To make the students understand the basics of computer networks and its importance in communication and resourcesharing.
2. To enable the students to understand OSI reference model and relatedmodels.
3. To enable the students to learn and apply algorithms related to network scheduling and error detection and correction .
4. To enable the students to understand and apply the design issues in construction of computer networks.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basics knowledge about computer networks. |
| Understand the basics of physical layer and public switched telephone networks. |
| Understand the fundamentals of elementary data link protocol and slidingwindow protocols |
| Apply various operations of algorithms in networks |
| Analyze about various types of protocol and layers |
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| **Unit:1** | **INTRODUCTION** |
| Introduction: Use of computer networks – Network Hardware – Network software – Reference models – Example of networks. |
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| **Unit:2** | **PHYSICAL LAYER** |
| The Physical Layer: The Theoretical basis for data communication – Guided transmission Media– Wireless transmission – Communication satellites – The Public switched Telephone network – Cable Television - Mobile telephone system. |
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| **Unit:3** | **DATA LINK LAYER** |
| Data link layer: Data link layer design issues – Error detection and correction – Elementary data link protocols – Sliding window protocols – Protocol Verification - Example data link Protocols. |
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| **Unit:4** | **NETWORK LAYER** |
| Network layer : Network layer design issues – Routing algorithms – Congestion, Control |



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| algorithms – Quality of service – Internetworking – Network layer in the internet. Transport layer: The transport service – Elements of transport protocol – A simple transport protocol - The internet Transport Protocols : UDP – The Internet Transport Protocols : TCP - Performance issues. |
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| **Unit:5** | **SESSION LAYER** |
| Session layer : Design issues, synchronization - Presentation layer : Design issues, cryptography – Application layer : Design issues, file transfer, E-mail. |
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| **Text Books** |
| 1 | Andrew S. Tanenbaum, “Computer Networks”, IV Edition, PHI/Pearson Education |
| 2 | P. Green – Computer Network Architectures and Protocols, Plenum Press, 1982. |
| 3 | Harry Katzan – An Introduction to “Distributed Data Processing”, A Petrocelli Book, New York / Princeton. |
| 4 | Godbole – Data Communication & Networking, TMH. |
| **Reference Books** |
| 1 | Leon Garcia – Communication Networks : Fundamental Concepts & Key Architecture, TMH. |
| 2 | Hari&Barani, “Projects in Networking”, 2005, SCITECH Publications |
| 3 | KanthiSwarup, P.K. Gupta and Manmohan, (2012), “Operations Research”, Sultan Chand and Sons. |
| 4 | S.D.Sharma, (2010), “Operations Research”, Sultan Chand’s Publications (India). |
| 5 | Manmohan and Gupta, (2011), “Problems on Operations Research”, Prentice Hall of India. |



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| **Course code** | **OPERATING SYSTEMS** | **Core** |
| **Pre-requisite** | Basic knowledge about various operating systems (DOS, Windows) |
| **Course Objectives:** |
| The main objectives of this course areto:1. Enable the studentstounderstand about operating systems, process management, CPU scheduling, memory management and secondary storagemanagement.
2. To enable the students to learn and apply the concepts using LINUX operatingsystem.
3. To enable students to understand and analyse shell programming.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the design issues associated with operating systems |
| Master various process management concepts like scheduling, deadlock management |
| Analyze on memory management |
| Analyze about the disk performance optimization and file systems |
| Analyze on Linux operating system |
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| **Unit:1** | **INTRODUCTION** |
| 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. |
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| **Unit:2** | **PROCESS MANAGEMENT** |
| PROCESS MANAGEMENT: Concepts-Process Scheduling-Operations on Processes- Cooperating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling. |
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| **Unit:3** | **PROCESS SYNCHRONIZATION** |
| PROCESS SYNCHRONIZATION: Critical Section-Synchronization Hardware Semaphores- Problems of Synchronization-Critical Regions-Monitors-Deadlocks Characterization-Handling Deadlocks-Deadlock Prevention – Avoidance-Detection-Deadlock Recovery. |
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| **Unit:4** | **MEMORY MANAGEMENT** |
| MEMORY MANAGEMENT: Storage Hierarchy-Storage Management Strategies Contiguous- |



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| 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. |
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| **Unit:5** | **I/O AND FILE SYSTEMS** |
| I/O AND FILE SYSTEMS: Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management **Case Study:** Linux Operating System – Commands, Shell Programming, Report writing |
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| **Text Books** |
| 1 | Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2004. |
| 2 | Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 1992. |
| **Reference Books** |
| 1 | P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall Of India, 2004. |
| 2 | H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002. |



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| **Course code** | **PRACTICAL I : JAVA PROGRAMMING LAB** | **Core** |
| **Pre-requisite** | Basic programming knowledge in C and C++ |
| **Course Objectives:** |
| The main objectives of this course are to:1. To teach fundamentals of object oriented programming in Java.
2. To familiarize java environment to create, debug and run simple javaprograms 3.To provide knowledge on JAVA API , SWINGS to create java Applications 4.To introduce JDBC for navigation ofrecords

5.To understand RMI, JAVABEANS & itsimplementation |
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand Object Oriented features using JAVA |
| Apply the concept of Polymorphism and Inheritance |
| Implement Exception Handling Mechanism |
| Develop interactive applications using Servlets and JAVABEANS |
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| **LIST OF PROGRAMS** |
| 1. Create an employee package to maintain the information about the employee. Use constructors to initialize the employee number and use overloading method to set the basic pay of the employee. By using this package create a javaprogram.
2. Program to implement polymorphism, inheritance and innerclasses.
3. Create a frame with user specific size and position it at user specific position (use command line argument). Then different shapes with different colours (usemenus).
4. Java program to handle different mouseevents.
5. Create an applet for a calculatorapplication.
6. Java program to maintain the student information in textfile.
7. Animate images at different intervals by using multi threadingconcepts.
8. Program to send a text message to another system and receive the text message from the system (use socketprogramming).
9. Java program by using JDBC concepts to access adatabase.
10. Java program to implementRMI.
11. Java program by using to implement the treeviewer.
12. Java bean program to view animage.
13. Java program that prohibit to reading of text files that containing badwords.
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| Expert lectures, online seminars – webinars |

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| **Text Books** |
| 1 | Deitel and Deitel, “ Java How to Program”, Third Edition, PHI/Pearson Education Asia. |
| 2 | Keyurshab,“Java 2 programming”, Tata McGraw-Hill Pub. Company Ltd. |
| **Reference Books** |
| 1 | C.Xavier,“Programming with Java 2”,SciTech Publications (India) P. Ltd. |
| 2 | Cays S. Horstmann, Gary Cornell, “Core Java2 Volume I – Fundamentals”, Pearson Edition, 2001 5. Cays S. Horstmann, Gary Cornell, “Core Java2 Volume II –Fundamentals”, Pearson Edition, 2003 |



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| **Course code** | **PRACTICAL II : RDBMS WITH ORACLE LAB** | **Core** |
| **Pre-requisite** | Basic programming using databases to store and retrieve data |
| **Course Objectives:** |
| The main objectives of this course are to:1. To study the features of commercial RDBMS packages such as Oracle and Developer2000
2. To give Foundation knowledge in database concepts, technology and practice to groom students into well informed database applicationdevelopers.
3. To give strong practice in SQL programming through a variety of databaseproblems. 4.To practice host language interface with embeddedSQL.
4. Develop database applications using front-end tools and back-endDBMS
5. To create forms and report writerpackage
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand Entity Relationship model and develop E-R diagrams for some applications |
| Write SQL queries to user specifications |
| Develop triggers, procedures, user defined functions and design accurate and PLSQL programs in Oracle |
| Prepare technical report on the observations of the experiments |
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| **LIST OF PROGRAMS** |
| **PRACTICALII RDBMS LAB**Study the features of commercial RDBMS packages such as Oracle and Developer 2000.Laboratory exercise should include defining scheme of applications, creation of a database, writing SQL queries to retrieve information from database.Use of host language interface with embedded SQL. Use of forms and report writer package.Some sample applications, which may be programmed, are given below.* Banking system variousschemes
* Online reservationsystem.
* Personalinformation.
* Student mark processing system (Internal and Externalmarks).
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| * Hotelmanagement.
* Stockmaintenance.
* College admission system. (both, UG andPG)
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| Expert lectures, online seminars – webinars |
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| **Text Books** |
| 1 | Raghu Ramakrishnan, Johannes Gehrke –“Database Management Systems”, Third Edition,McGraw-Hill Higher Education. |
| 2 | Silberschatry, Korth, Sundarshan, “Database system Concepts”, Fourth Edition, McGraw-Hill Higher Education |
| **Reference Books** |
| 1 | Elmasri, Navathe, “Fundamentals of Database Systems”, Third Edition, Pearson EducationAsia |
| 2 | S.S. Khandare, “Database Management and Oracle Programming”, First Edition, 2004, S.Chand and Company Ltd. 5. Nilesh Shah, “Database Systems using Oracle”, 2002, Prentice Hall of India. 6. Rajesh Narang, “Database Management Systems”, 2004, PrenticeHall of India |



Second Semester



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| **Course code** | **DATA MINING AND BIG DATA ANALYTICS** | **Core** |
| **Pre-requisite** | Basic Knowledge about various types of Data and statistical methods for retrieval and analysis . |
| **Course Objectives:** |
| The main objectives of this course are to:1. To motivate the students as well to enrich their knowledge about the concepts of data manipulation and bigdata.
2. To enable the students to understand and analyse various dataminingapplications.
3. To enable the students to understand and apply Big Data to Businessproblems.
4. To enable the students to analyse business models by high performance deepanalytics.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basic data mining techniques and algorithms |
| Understand about the Big Data evaluation |
| Analyze on clustering methods |
| Compare and evaluate different data mining techniques like classification and prediction |
| Apply and Analyze Big Data to Business problems |
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| **Unit:1** | **INTRODUCTION** |
| Introduction – Data Mining – Relational Databases – Data Warehouses – Transactional databases– Data Mining functionalities – Classification of Data Mining systems – Major Issues in Data Mining. |
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| **Unit:2** | **DATA PREPROCESSING** |
| Data Preprocessing – Data cleaning – Missing value, noising data and inconsistent data – Data integration and Transformation – Data reduction – Data cube aggregation – Dimensionality reduction and data compression – Data mining primitives. |
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| **Unit:3** | **CLASSIFICATION** |
| Classification and predictions – Issues regarding classification and prediction – Classifications by decision tree induction – Classification by Back propagation – Other classification methods. |
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| **Unit:4** | **CLUSTER** |
| Cluster Analysis – Types of Data in Cluster Analysis – Interval – Scaled variables, Binary variables, Nominal ordinal and ratio - scaled variables – Clustering methods –Partitioning |



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| methods – K-means, k-medoids and CLARANS – Hierarchical methods – Agglomerative and Divisive, BIRCH, CURE – Outlier analysis – Data Mining applications. |
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| **Unit:5** | **BIG DATA** |
| The Big Deal about Big Data: What is Big Data - Why Is Big data important - Big Data. Applying Big Data to Business problems: A sampling of use cases - Big Data use cases - IT for IT – Customer state. Analytics for Big Data at Rest: The Big Data platform for high performance deep analytics- Appliance simplicity – Hardware Acceleration-Balance, massively parallel architecture - Modulardesign. |
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| **Text Books** |
| 1 | Jinweihan, MichelineKambler, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi. (For Unit I, II, III and IV). |
| 2 | Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, “Harness the Power of Big Data”, The McGraw-Hill Publications, 2013, First Edition. (For Unit V). |
| **Reference Books** |
| 1 | Pieter Adriaans, DolfZantinge, "Data Mining", Addison Wesley, 1998. Sam Anohory, Dennis Murrey, "Dataware housing in the real world", Pearson, 2004. |



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| **Course code** | **.NET PROGRAMMING** | **Core** |
| **Pre-requisite** | Basics of internet programming. |
| **Course Objectives:** |
| The main objectives of this course areto:1. To enable the students to understand and apply the practical aspects of application. development using .Netframework.
2. To enable the students to understand the Common Language Runtime (CLR), .Net frameworkclasses.
3. To enable the students to understand and apply the .NET concepts usingC#.
4. To enable the students to understand and apply .NET concepts usingADO.netProgramming
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the concepts of .NET Framework Technology |
| Apply error handling techniques in .NET |
| Demonstrates the C# console applications |
| Design and develop the Web applications using C# |
| Design and develop the distributed data driven applications using .NET framework |
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| **Unit:1** | **EVOLUTION OF WEB DEVELOPMENT** |
| **Evolution of Web Development:** HTML Forms-Server Side and Client Side Programming. Developing ASP.Net Applications – Visual Studio: Creating Websites- Designing a Webpage- The anatomy of a Web form – Writing Code. Web Form Fundamentals: The anatomy of an ASP.Net application – Introducing Server Controls – Improving the Currency Converter – A Deeper Look at HTML Control Classes – The Page Class. Web Controls: Steeping up to Web Controls – Web Control Classes – List Controls – Table Controls – Web Control Events and AutoPostBack |
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| **Unit:2** | **STATE MANAGEMENT** |
| **State Management:** The problem of State – View State – Transferring Information between Pages – Cookies – Session State – Session State Configuration. Error Handling, Logging, and Tracing: Common Errors – Exception Handling – Handling Exceptions – Throwing Your Own Exceptions – Logging Exceptions – Error Pages – Page Tracing. Deploying ASP.Net Applications: ASP.Net Applications and the Web Server – Internet Information Services(IIS) – Managing Websites with IIS Manager – Deploying a Simple Site – Deploying with Visual Studio. |
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| **Unit:3** | **C#** |
| **C# Language:** C# Languages Basics – Variables and Data Types – Variable operations – Object based manipulation – Conditional Logic – Loops – Methods. Types, Objects and Namespaces: |



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| Classes – Value types and reference types – Understanding namespaces and assemblies. |
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| **Unit:4** | **ENUMERATORS, INTERFACES AND EVENTS** |
| **C#:** Enumerators and Iterators – Exceptions - Serializing objects - Deep serialization-XML based serialization - Multithreading – Interfaces and Structures - Delegates and Events – Indexers and Properties. |
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| **Unit:5** | **ADO.NET FUNDAMENTALS** |
| **ADO.NET Fundamentals:** Understanding Data Management – Configure database – SQL Basics - ADO.Net basics – Direct Data Access – Disconnect Data Access. Data Binding: Single- Value databinding |
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| **Text Books** |
| 1 | Matthew MacDonald (2008), Beginning ASP.NET 3.5 in C#, 2/e; A press Berkeley. |
| 2 | Jesse Liberty (2003), Programming Visual Basic .NET, 2/e; O’Reilly, Shroff Publishers and Distributors Pvt. Ltd. |
| 3 | Bill Evjen, Jason Beres (2009), Visual Basic .Net Bible, Hungry Minds Inc. |
| **Reference Books** |
| 1 | Herbert Schildt (2010), Complete Reference C#, Tata McGraw-Hill. |
| 2 | Joe Duffy(2010), Professional .Net Framework 2.0l, Wiley India. |



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| **Course code** | **OPERATIONS RESEARCH** | **Core** |
| **Pre-requisite** | Basic applications of Mathematics and Business Mathematics. |
| **Course Objectives:** |
| The main objectives of this course are to:1. Learn formulation of LPP, mathematical formulation, feasible solution to transport problem, EOQmodel.
2. Learn individual replacement, group replacement and the characteristics of queuingtheory.
3. apply PERT / CPM for NetworkConstruction.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Firm basis for understanding thelinear programming problems. |
| Toconstructnetworks,apply queuing theory andreplacementmodelconcepts. |
| Apply the optimality in transportation problem. |
| Analyze oninventory control. |
| Solve a wide range of problems related to network construction through PERT / CPM |
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| **Unit:1** | **LINEAR PROGRAMMING** |
| LINEAR PROGRAMMING : Formulation of LPP – Graphical solutions to LPP –Simplex Method - Big M method – Two – Phase Simplex Method - Duality in Linear Programming: Primal & Dual Problems – Dual Simplex Method. |
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| **Unit:2** | **PROBLEMS** |
| THE TRANSPORTATION PROBLEM: Introduction – Mathematical Formulation- Finding Initial Basic Feasible Solutions – Moving towards Optimality – Unbalanced Transportation Problems – Degeneracy.THE ASSIGNMENT PROBLEM: Introduction – Mathematical formulation - Hungarian Assignment Method – Maximization in Assignment Problem – Unbalanced AssignmentProblem– Impossible Assignment. |
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| **Unit:3** | **INVENTORY CONTROL** |
| INVENTORY CONTROL : Introduction – Costs involved in inventory - Deterministic models : EOQ models without and with shortage - Buffer stock and Reorder Level – Price Break models – ABC Analysis. |
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| **Unit:4** | **REPLACEMENT MODEL** |
| REPLACEMENT MODEL: Introduction – Replacement of items that deteriorates gradually : |



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| value of money does not change with time – value of money changes with time – Replacement of items that fails suddenly : Individual Replacement –Group Replacement.PERT/CPM: Introduction – Construction of Network - CPM calculations –PERT Calculations. |
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| **Unit:5** | **QUEUING THEORY** |
| QUEUING THEORY: Introduction - Characteristics of queuing system - Problems of single server with finite / infinite population model – Problems of multi server with finite /infinite population model.(No derivation). |
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| **Text Books** |
| 1 | KantiSwarup, P.K. Gupta, Man Mohan, “Operations Research”, Sultan Chand & Sons. |
| 2 | P.K. Gupta, D.S Hira, “Problems in Operations Research”, S.Chand& Company Ltd. |
| 3 | Hamdy A. Taha, “Operations Research – An Introduction”, Seventh Edition, PHI/Pearson Education. |
| **Reference Books** |
| 1 | Frederick S. Hillier, Gerald J. Lieberman, “Introduction to Operations Research”, Tata McGraw Hill Pub Company Ltd., Seventh Edition. |
| 2 | J.K.Sharma, “Operations Research Theory and Applications”, Macmillan India Ltd., SecondEdition. |



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| **Course code** | **SOFTWARE PROJECT MANAGEMENT** | **Core** |
| **Pre-requisite** | Basics of Software . |
| **Course Objectives:** |
| The main objectives of this course are to enable the students:1. To understand basics and importance of SoftwareEngineering.
2. To get a deep insight to software project managementconcepts.
3. To understand the software project, Analyze project Characteristics, estimate efforts, project evaluation,andselectionofprocessmodel,softwareeffortestimation,riskmanagementand

managing contracts. |
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basic concepts of Software Project Management |
| Identify the different project contexts and suggest an appropriate management strategy |
| Demonstrate through application, knowledge of the key project management skills, such as product and work break-down structure, schedule, governance including progress reporting, risk and quality management |
| Analyze a comparison on Product Versus Process Quality Management |
| Perform case studies on cost estimation models like COCOMO |
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| **Unit:1** | **INTRODUCTION** |
| Introduction: Software Engineering, Software Myths, Layered Technology, Process Models, Software Project Management - Software Project Versus Other Project – Requirement Specification – Information and Control in Organization – Introduction to step wise Project Planning – Select – Identify Scope and Objectives - Identify Project Infrastructure – Analyze Project Characteristics – Products and Activities – Estimate Effort for each Activity – Identify Activity Risks – Allocate Resources - Review / Publicize Plan – Execute Plan and Lower Levels of Planning. |
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| **Unit:2** | **PROJECT EVALUATION** |
| Project Evaluation : Introduction – Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation – Selection of an Appropriate Project App roach – Choosing Technologies – Choice of Process Models – Structured Methods – Rap id Application Development – Waterfall Model – VProcess Model – Spiral Model – Software Prototyping – Ways of Categorizing Prototypes – Tools – Incremental Delivery – Selection Process Model. |
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| **Unit:3** | **SOFTWARE EFFORT ESTIMATION** |
| Software Effort Estimation : Introduction – Problem s with Over and Under Estimates – Basis for Software Estimating – Software Effort Estimation Technique – Albrecht Function PointAnalysis– Function Points – Object Points – Procedural Code Oriented Approach – COCOMO – Activity Planning – Project Schedules - Projects and activities – Sequencing and Scheduling Activities – Network Planning Models – Formulating a Network Planning – Adding Time Dimension – Forward Pass – Backward Pas s – Identifying the Critical Path – Activity Float - Shortening Project Duration – Identifying Critical Activities – Precedence Networks. |
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| **Unit:4** | **RISK MANAGEMENT** |
| Risk Management : Introduction – Nature of Risk Man aging Identification – Analysis – Reducing–Evaluating–Zvalues–ResourceAllocation–NatureofResources–Requirements* Scheduling – Critical Paths – Counting the Cost – Resource Schedule – Cost Schedule – Scheduling Sequence – Monitoring and Control – Creating the Frame Work - Collecting theData
* Visualizing the Progress – Cost Monitoring – Prioritizing Monitoring – ChangeControl.
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| **Unit:5** | **SOFTWARE QUALITY** |
| Managing Contracts : Introduction – Types of Contract – Stages in Contract Placement – Terms of Contract – Contract Management – Acceptance – Managing People and Organizing Teams – Organizational Behavior Background – Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – Decision Making – Leadership – Organizational Structures – Software Quality – Importance – Practical Measures – Product Versus Process Quality Management – External Standards – Techniques to Help Enhance SoftwareQuality. |
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| **Text Books** |
| 1. | Roger .S.Pressman: Software Engineering, Tata McGrawHill , V Edition. |
| 2 | Bob Hughes and Mike Cottrell, “Software Project Management”, McGraw Hill, Second Edition. |
| **Reference Books** |
| 1. 3
 | Walker Royce, “Software Project Management”, Addition Wesley. |
| 1. 4
 | DerrelInce, H. Sharp and M. Woodman, “Introduction to Software Project Management and Quality Assurance”, Tata McGraw Hill,1995. |
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| **Course code** | **PRACTICAL III : DATA MINING LAB** | **Core** |
| **Pre-requisite** | Basics of Datamining algorithms and various tools available. |
| **Course Objectives:** |
| The main objectives of this course are to:1. To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression….
2. To understand & write programs using thealgorithms
3. To apply statistical interpretations for thesolutions
4. Able to use visualizationstechnique
5. To apply WEKA tool in attribute selection, decision tree,etc…
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| To write programs using R for Association rules, Clustering techniques |
| To implement data mining techniques like classification, prediction |
| Able to use different visualizations techniques using R |
| To understand different data mining algorithms to solve real world applications and train data using WEKA tool |
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| **LIST OF PROGRAMS** |
| 1. Implement any 3 classification algorithms and compare the results.
2. Implement any 2 clustering algorithms using any open source data miningtool.
3. Implement the algorithm to generate a decision tree for the given dataset.
4. Develop an application to extract association mining rules.
5. Develop an application for implementing one of the clusteringtechniques.
6. Develop an application for implementing Naïve Bayesclassifier.
7. Implement Aprioriapproach.
8. Design a knowledge flow layout to load, apply attribute selection, and normalize the attributes and to store the results in a CSV saver using WEKAtool.
9. Create a decision tree and train the tree using the given dataset as the training data. Report the model obtained after training using WEKAtool.
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| **Text Books** |

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| 1 | Jinweihan, MichelineKambler, “Data Mining: Concepts and Techniques”, Morgan Kaufman Publishers, New Delhi. (For Unit I, II, III and IV). |
| 2 | Paul C Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, David Corrigan, James Giles, “Harness the Power of Big Data”, The McGraw-Hill Publications, 2013, First Edition. (For Unit V). |
| **Reference Books** |
| 1 | Pieter Adriaans, DolfZantinge, "Data Mining", Addison Wesley, 1998. Sam Anohory, Dennis Murrey, "Dataware housing in the real world", Pearson,2004. |



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| **Course code** | **PRACTICAL IV : .NET PROGRAMMING LAB**(Effective for the candidates admitted from the academic Year 2020- 2021) | **Core** |
| **Pre-requisite** | OOPs, database concepts and Internet Programing to develop Web applications. |
| **Course Objectives:** |
| The main objectives of this course are to:1.To Understand & write web applications using ASP.NET 2.To implement OOPS concepts using C#1. To Develop the Web applications usingC#
2. To Design and develop the data base applications using ADO.NETcontrol.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand to create web pages using ASP.NET |
| Capable of developing interactive web applications using ASP.NET |
| Able to write dynamic web applications using C# |
| Must be able develop data base applications using ADO.NET control |
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| **LIST OF PROGRAMS** |
| **ASP.NET PROGRAMS**1. CollegeWebsite
2. OnlineExaminationSystem
3. Online Mobilephoneshop
4. Onlineregistrationform

**C# PROGRAMS**1. Student Information usinginheritance.
2. Sales bill preparation usinginterface.
3. Insert record using data gridview.
4. Create user loginform.

**ADO.NET Programming**1. Develop a Windows application with ADO.NET to perform Insert, Delete, Updateand Selectoperations.
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| 10. Build an ADO.NET program which displays the Employee information in the relevant fields from the database which already exists. |
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| **Text Books** |
| 1 | Matthew MacDonald (2008), Beginning ASP.NET 3.5 in C#, 2/e; A press Berkeley. |
| 2 | Jesse Liberty (2003), Programming Visual Basic .NET, 2/e; O’Reilly, Shroff Publishers and Distributors Pvt. Ltd. |
| 3 | Bill Evjen, Jason Beres (2009), Visual Basic .Net Bible, Hungry Minds Inc. |
| **Reference Books** |
| 1 | Herbert Schildt (2010), Complete Reference C#, Tata McGraw-Hill. |
| 2 | Joe Duffy(2010), Professional .Net Framework 2.0l, Wiley India. |
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| **Course code** | **PRACTICAL V : WEB APPLICATION DEVELOPMENT AND HOSTING** (Effective for the candidates admitted from the academic Year 2020-2021) | **Core** |
| **Pre-requisite** | Basic Programming using HTML Tags |
| **Course Objectives:** |
| The main objectives of this course are to:1. Able to design a web page using HTMLtags
2. To enable the students to use Framesets, hyper links and different formatting features of HTML tags
3. Enable the students to use Forms & other controls in a web page 4.To create interactive applications usingPHP
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand & implement the basic HTML tags to create static web pages |
| Capable of using hyperlinks, frames ,images, tables, in a webpage |
| Able to write dynamic web applications using HTML forms |
| Must be able to write dynamic web applications in PHP & HTML tags using XAMPP. |
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| **LIST OF PROGRAMS** |
| 1. Develop a website for your college using advanced tags ofHTML.
2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction aboutIndia.
3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data.
4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital usingHTML.
5. Develop a HTML document to print your Bio-Data in a neat format using several components
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| 1. Develop a Registration Form for an inter-collegiate function and validate using JavaScript.
2. Develop and display customer details using XML with XSL transformation and validate the document using DTD orXSD
3. Develop and display student personal details in XMLformat.
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| **Text Books** |
| 1 | Ivan Bayross, “Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP”, BPB Publications, 4th Revised Edition, 2010. |
| **Reference Books** |
| 1 | A.K.Saini and SumintTuli, “Mastering XML”, First Edition, New Delhi, 2002. |
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Third Semester



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| **Course code** |  | **PHP PROGRAMMING** | **Core** |
| **Pre-requisite** | Basic programming knowledge and Internet Programming. |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the Introduction to PHP, PHP functions, database handling and in addition AJAX is taught.
2. Enable the students to learn the fundamentals of Open Source software and get experiencein PHP andAJAX.
3. Acquire skills to write PHPprograms.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the concepts of open source softwares |
| Understand the functions and browser handling power of PHP |
| Apply object oriented concepts and file handling concepts of PHP |
| Evaluate database and set sessions, cookies and FTP |
| Develop web pages using PHP |
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| **Unit:1** | **OPEN SOURCE SOFTWARE** |
| **Open Source Softwares:** Overview of Free/ Open Source Software: The Open Source Definition- Examples of OSD Compliant Licenses - Examples of Open Source Software Product – The Open Source Software Development Process – A History of Open Source software: The Berkeley Software Distribution – The Free Software Foundation – Linux – Apache – Mozilla – Open SourceSoftware.**PHP:** Introduction – Essential PHP – Operators and Flow control: Working with math, assignment, increment and decrement, string, bitwise, execution, comparison and logical operators, Working with loops – Strings andArrays. |
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| **Unit:2** | **FUNCTIONS AND WEB PAGES** |
| PHP Functions and Browser handling power: Creating Functions, passing functions, passing arrays, pass by reference, default arguments, returning data, arrays, lists, references, accessing global data, working with static variables, PHP conditional functions, variable functions, nesting functions – Reading data in web pages: Handling text fields, areas, check boxes, radio buttons, list boxes, password controls, hidden controls, image maps, file uploads, buttons – PHP Browser handlingpower. |
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| **Unit:3** | **OOPS AND FILES** |
| Working with Object oriented programming and File handling: Object oriented programming: creating classes, objects, setting access to properties and methods, using constructors and destructors, inheritance, overriding and overloading methods, auto loading classes – File Handling: open, read, close, parsing files, copy, delete, write and append files. |
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| **Unit:4** | **DATABASE, SESSION AND COOKIES** |
| Working with databases and setting sessions, cookies and FTP: Databases: creating, accessing, updating, inserting, deleting and sorting databases – Setting sessions, cookies and FTP: setting, reading, and deleting cookies, working, downloading, uploading, deleting, creating and removing directories with FTP. |
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| **Unit:5** | **AJAX** |
| AJAX and Drawing Images on the server: Ajax: Handling AJAX requests, downloading images using AJAX, downloading javascript with AJAX– Drawing images on the server: creating and displaying images, drawing lines, rectangles, ellipse, arcs, polygons, figures, individual pixels, text, virtual text, working with image files, tiling images, copying images. |
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| **Text Books** |
| 1 | Joseph Feller, Brain Fitzgerald, Eric S. Raymond, “Understanding Open Source Software Development”, Addison-Wesley Professional, 1st Edition, 2001. |
| 2 | “The Complete Reference PHP Covers PHP 5.2, “Steven Holzner, Tata McGraw-Hill Edition 2008. |
| **Reference Books** |
| 1 | PHP6 and MySQL6 Bible – Steve Svehring. |
| 2 | PHP Programming Solutions – VickramViswani. |
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| **Course code** |  | **SOFTWARE TESTING** | **Core** |
| **Pre-requisite** | Basics of software testing . |
| **Course Objectives:** |
| The main objectives of this course are to:1. Provides principles of Software Testing andtools.
2. Enable the students to learn about the principle and tools of Softwaretesting.
3. Improve knowledge in softwaretestingtools.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the fundamentals of software testing |
| Gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects |
| Analyze path testing concept |
| Analyze state testing concept |
| Execute programs and test data in Client-Server Architecture |
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| **Unit:1** | **SOFTWARE TESTING** |
| Purpose of Software testing – Some Dichotomies – a model for testing – Playing pool and consulting oracles – Is complete testing possible – The Consequence of bugs – Taxonomy of Bugs. |
|  |
| **Unit:2** | **TESTING FUNDAMENTALS** |
| Software testing Fundamentals – Test case Design – Introduction of Black Box Testing and White Box testing – Flow Graphs and Path testing – Path testing Basics - Predicates, Path Predicates and Achievable Paths - Path Sensitizing – Path Instrumentation – Implementation and Application of PathTesting. |
|  |
| **Unit:3** | **TRANSACTION FLOW** |
| Transaction Flow testing – Transaction Flows – techniques – Implementation Comments – Data Flow Testing – Basics – Strategies – Applications, Tools and effectiveness – Syntax Testing – Why, What, How – Grammar for formats – Implementation – Tips. |
|  |
| **Unit:4** | **LOGIC TESTING** |
| Logic Based Testing – Motivational Overview – Decision tables – Path Expressions – KV Charts* Specifications – States, State Graphs and transition Testing – State Graphs – Good & badstates
* state testing Metrics andComplexity.
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| **Unit:5** | **TESTING TYPES** |
| Testing GUIs – Testing Client – Server Architecture – Testing for Real-time System – A Strategic Approach to Software testing – issues – unit testing – Integration Testing – Validation testing – System testing – The art ofDebugging. |
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| **Text Books** |
| 1 | Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003. |
| 2 | Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979. |
| **Reference Books** |
| 1 | Roger.S.Pressman, Software Engineering – A Practitioner’s Approach,McGraw Hill, 5th edition, 2001. |
| 2 | Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007. |



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| **Course code** |  | **NETWORK SECURITY and CRYPTOGRAPHY** | **Core** |
| **Pre-requisite** | Basics of Networks and its Security |
| **Course Objectives:** |
| The main objectives of this course are to:1. Deal with principles of encryption algorithms, and conventional and public keycryptography.
2. Enable to know the levels of network security and securitytools.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Remember the basic knowledge on security models |
| Understand the concept of AES and DES cipher |
| Apply on encryption function |
| Analyze about public key cryptography and RSA |
| Analyze on authentication functions in security |
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| **Unit:1** | **INTRODUCTION** |
| Service mechanism and attacks – The OSI security architecture – A model for network security – symmetric Cipher model – Substitution techniques – transposition techniques – simplified des – block chipper principles – the strength of des – blockcipher design principles and modes of operation. |
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| **Unit:2** | **ENCRYPTION** |
| Triple des-blow fish – RCS Advanced Symmetric Block Ciphers –RC4 stream Cipher confidentially using symmetric encryption – introduction to number theory – public – key cryptography and RSA. |
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| **Unit:3** | **KEY MANAGEMENT** |
| Key management – Diffie Hellman key exchange – message authentication and hash function – hash algorithm – digital signature and authentication protocols – digital signature standard. |
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| **Unit:4** | **SECURITY** |
| Authentication application – pretty good privacy – S/MIME – IP security – web security considerations –secure socket layer transport layer security –secure electronic transaction. |
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| **Unit:5** | **INTRUDERS AND VIRUS** |
| Intruders –intrusion detection – password management –viruses and related threats – virus |

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| countermeasures – fire wall design principles – trusted systems |
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| **Text Books** |
| 1 | William Stallings, “Cryptography and Network Security Principles and Practices”. Fourth Edition, PHI. |
| 2 | AtulKahate, “Cryptography and Network Security”,Second Edition, TMH. |
| **Reference Books** |
| 1 | BehrouzA.Forouzan, “Cryptography and Network Security”, TMH. |
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| **Course code** |  | **CLOUD COMPUTING** | **Core** |
| **Pre-requisite** | Basics of cloud and its applications |
| **Course Objectives:** |
| The main objectives of this course are to:1. Understand the cloud computing architectures, applications and challenges.
2. Know how the data is stored in the cloud and the various services offered by thecloud.
3. Develop the skills in Web Application Development using cloudtechnologies.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basic knowledge on virtualization |
| Understand the concept of cloud computing services and its business value |
| Analyze various web based applications for collaborating everyone in cloud computing |
| Assess various industrial platforms for the developments |
| Analyze on cloud mobility and governance |
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| **Unit:1** | **INTRODUCTION** |
| Introduction – Essentials – Benefits – Why cloud – Business and IT perspective – cloud and virtualization – cloud service requirements – dynamic cloud infrastructure – cloud computing characteristics – cloud adoption – cloud rudiments. Cloud deployment models: introduction – cloud characteristics – measured service accounting – cloud deployment models – security in a public cloud – public versus private clouds – cloud infrastructure self-service. |
|  |
| **Unit:2** | **SERVICES** |
| Cloud as a service: introduction – gamut of cloud solutions – principal technologies- cloud strategy – cloud design and implementation using SOA – conceptual cloud model – cloud service defined. Cloud solutions: introduction – cloud ecosystem – cloud business process management – cloud service management – on premise cloud orchestration and provisioning engine – computing ondemand. |
|  |
| **Unit:3** | **VIRTUALIZATION** |
| Cloud offerings: Introduction – introduction storage, retrieval archive and protection-cloud analytics – testing under cloud – information security – virtual desktop infrastructure-storage cloud. Cloud Management: Introduction – resiliency – provisioning – asset management-cloud governance – high availability and disaster recovery – charging models – usage reporting, and metering. Cloud Virtualization Technology: Introduction – virtualization demand – virtualization benefits – server virtualization – virtualization for x86 architecture – hypervisor management |



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| software – virtual infrastructure requirements. |
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| **Unit:4** | **CLOUD INFRASTRUCTURE** |
| Cloud Infrastructure: Introduction – storage virtualization – storage area networks-network- attached storage – cloud server virtualization – networking essential to the cloud. Cloud and SOA: Introduction – SOA Journey to Infrastructure – SOA and the cloud – SOA Defined – SOA and infrastructure as a service – SOA based cloud infrastructure steps – SOA Business and IT services. |
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| **Unit:5** | **CLOUD MOBILITY** |
| Cloud Mobility: Introduction – the business problem – mobile enterprise application platforms – mobile application architecture overview. Cloud Governance: Introduction – service level agreement and compliance – data privacy and protection risks – enterprise governance – risk management – third party management – information management. |
|  |
| **Text Books** |
| 1 | Dr. Kumar Saurabh “Cloud Computing-Unleashing Next Gen Infrastructure to Application”, 3rd Edition, Wiley India Pvt Ltd, 2014. |
| 2 | RajkumarBuyya, James Broberg, AndrzejGoscinski , “Cloud computing principles and paradigms”, Wiley India, 2014. |
| **Reference Books** |
| 1 | Michael Miller, “Cloud computing web based application that change the way you work & collaborate online”, Pearson Education, 2013. |
| 2 | Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business” |



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| **Course code** | **PRACTICAL VI : PHP PROGRAMMING LAB** | **Core** |
| **Pre-requisite** | Basic knowledge on HTML, MySQL, CSS and Java Script. |
| **Course Objectives:** |
| The main objectives of this course are to:* Understand the features like basic functions and features inPHP.
* Be able to know the implementation of File handling, OOPs concepts, cookies in PHP
* Able to write PHP programs for Filemanipulation
* Able to write a Data base application inPHP
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand to write programs in PHP for OOPS concepts |
| Capable of developing interactive web applications using PHP |
| Able to write PHP programs for File handling |
| Must be able develop data base applications using PHP |
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| **LIST OF PROGRAMS** |
| 1. Write a PHP Program forStringhandling.
2. Write a PHP Program for associativearray.
3. Write a PHP Program to use various Functions ofPHP.
4. Write a PHP Program to read formdata.
5. Write a PHP Program to implement Overloading andoverriding.
6. Write a PHP Program to implementInheritance.
7. Write a PHP Program for Filehandling.
8. Develop PHP Program to Create a Database and to Insert , Delete and List therecords.
9. Write a PHP Program to implementcookies.
10. Write a PHP Program for Drawing images on awebpage.
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| **Text Books** |
| 1 | Joseph Feller, Brain Fitzgerald, Eric S. Raymond, “Understanding Open Source SoftwareDevelopment”, Addison-Wesley Professional, 1st Edition, 2001. |
| 2 | “The Complete Reference PHP Covers PHP 5.2, “Steven Holzner, Tata McGraw-HillEdition 2008. |
| **Reference Books** |
| 1 | PHP6 and MySQL6 Bible – Steve Svehring. |
| 2 | PHP Programming Solutions – VickramViswani. |
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| **Course code** | **PRACTICAL VII : SOFTWARE TESTING LAB** | **Core** |
| **Pre-requisite** | Basics of various software testing and testing tools |
| **Course Objectives:** |
| The main objectives of this course are to:1. This course focuses on the Testing phase ofSDLC
2. This course enables the students to learn about Software Testing & itsTypes
3. It also enable the students to write Test Cases, about different testing tools and its applications
4. It gives a clear picture about the role of Testing phase & its importance inSDLC.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the concepts of Software Testing, & its tools |
| Able to understand different testing phases & to execute it |
| Must be able to evaluate the results with respect to the specifications |
| Application of different tools, according to the testing process. |
|  |
| **LIST OF PROGRAMS** |
| Various S/W Testing Can Be Done Related To the Methods Given Below Using Any of the S/W Testing Tools1. Design Phasetesting
2. Program PhaseTesting.
3. Debugging
4. Evaluation of testresults
5. Installation phase testing & Acceptancetesting
 |
| **Text Books** |
| 1 | Boris Beizer, Software testing techniques, DreamTech Press, Second Edition – 2003. |
| 2 | Myers and Glenford.J., The Art of Software Testing, John-Wiley & Sons,1979. |
| **Reference Books** |
| 1 | Roger.S.Pressman, Software Engineering – A Practitioner’s Approach,McGraw Hill, 5thedition, 2001. |

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| 2 | Marnie.L. Hutcheson, Software Testing Fundamentals, Wiley-India,2007. |
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**PRACTICAL VII- MINI PROJECT (GUIDELINES FOR MINI PROJECT)**

* The aim of the Mini Project is to lay a foundation for the MainProject.
* Each student should carry out individually one Mini Project Work and it may be a case study using the software packages that they have learnt or may be an implementation of a concept in a paper prescribed on ajournal.
* It should be compulsorily done in the college only under the supervision of the staff concerned.
* University Exam will be conducted as like a practical exam with one Internal and one External Examiner, which carries 50 marks for project evaluation and 25 marks for viva examination. Remuneration for the examiners is equivalent as that of practicalexamination.



Elective Courses



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| **Course code** | **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS** | **Elective** |
| **Pre-requisite** | Basics of Artificial Intelligence and its applications |
| **Course Objectives:** |
| The main objectives of this course are to:1. Enrich the knowledge about the concepts of ArtificialIntelligence.
2. Know the concepts of AI problems andtechniques.
3. Learn about Structures & ExpertSystem.
 |
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Demonstrate AI problems and techniques |
| Know the various searching techniques, constraint satisfaction problems and example problems |
| Apply and analyze basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning |
| Analyze knowledge Structures & Expert System |
| Analyze and design a real world problem for implementation and understand the dynamic behavior of a system |
|  |
| **Unit:1** | **INTRODUCTION** |
| Introduction: AI Problems – Al techniques – Criteria for success. Problems, Problem Spaces, Search: State space search – Production Systems – Problem Characteristics – Issues in design of Search. |
|  |
| **Unit:2** | **SEARCH TECHNIQUES** |
| Heuristic Search Techniques: Generate and Test – Hill Climbing – Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings – Approaches to Knowledge representations – Issues in Knowledge representations – FrameProblem. |
|  |
| **Unit:3** | **PREDICATE LOGIC** |
| Using Predicate Logic: Representing simple facts in logic – Representing Instance and Isa relationships – Computable functions and predicates – Resolution – Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge – Logic programming – Forward Vs Backward reasoning – Matching – Controlknowledge. |
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| **Unit:4** | **REASONING** |

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| Statistical Reasoning: Probability and Bayes Theorem- Certainty Factors and Rule- Based systems Bayesian Networks - Dempster - Shafer Theory-Fuzzy logic . Knowledge representation: Syntactic - Semantic Spectrum of Representation-Logic and Slot-and Filter Structures - Other Representational Techniques – Planning – Understanding. |
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| **Unit:5** | **EXPERT SYSTEM** |
| Learning – Common sense – Perception and Action – Expert System. |
|  |
| **Text Books** |
| 1 | Elaine Rich and Kevin Knight," Artificial Intelligence", Tata McGraw Hill Publishers company Pvt. Ltd, Second Edition, 1991. |
| **Reference Books** |
| 1 | George F Luger, "Artificial Intelligence", 4th Edition, Pearson Education Publ., 2002. |
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| **Course code** | **MOBILE COMPUTING** | **Core** |
| **Pre-requisite** | Basics of mobile communication |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the overview of Mobile computing, Applications andArchitectures.
2. Describe the futuristic computingchallenges.
3. Enable the students to learn the concept of mobilecomputing.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the need and requirements of mobile communication |
| Focus on mobile computing applications and techniques |
| Demonstrate satellite communication in mobile computing |
| Analyze about wireless local loop architecture |
| Analyze various mobile communication technologies |
|  |
| **Unit:1** | **INTRODUCTION** |
| Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication – Requirements of Mobile Communication – History of Mobile Communication. |
|  |
| **Unit:2** | **MOBILE COMMUNICATION** |
| Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management – Frequency Management – Cordless Mobile Communication Systems. |
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| **Unit:3** | **MOBILE COMPUTING** |
| Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication. |
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| **Unit:4** | **INTERNET** |
| Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless ApplicationProtocol. |
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| **Unit:5** | **COMMUNICATION SYSTEM** |
| WCDMA Technology and Fibre Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems. |
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| **Text Books** |
| 1 | T.G. Palanivelu, R. Nakkeeran, “Wireless and Mobile Communication”, PHI Limited, 2009. |
| 2 | Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2007. |
| **Reference Books** |
| 1 | Asoke K Talukder,HasanAhmed,RoopaYavagal, “[Mobile Computing](http://mheducation.co.in/html/9780070144576.html)”,TMH, 2010. |



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| **Course code** | **DISTRIBUTED COMPUTING** | **Elective** |
| **Pre-requisite** | Basics of distributed networks, databases and processing. |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the introduction to fully distributed processing systems, communication line loading and client/server network model.
2. Enable the students to learn the concepts of distributedcomputing.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand distributed processing and network systems |
| Learn factors, resources and responsibilities of distributed systems. |
| Analyze distributed database and decision trees. |
| Acquire knowledge about network models |
| Design distributed database and project techniques. |
|  |
| **Unit:1** | **DISTRIBUTED SYSTEMS** |
| Distributed Systems: Fully Distributed Processing Systems – Networks and Interconnection Structures – Designing a Distributed Processing System. |
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| **Unit:2** | **DISTRIBUTED DATA** |
| Distributed Systems: Pros and Cons of Distributed Processing – Distributed Databases – The Challenge of Distributed Data – Loading Factors – Managing the Distributed Resources – Division of Responsibilities. |
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| **Unit:3** | **DESIGN** |
| Design Considerations: Communication Line Loading – Line Loading Calculations – Partitioning and Allocation – Data Flow Systems – Dimension Analysis – Network Database Design Considerations – Ration Analysis – Database Decision Trees – Synchronization of Network Databases. |
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| **Unit:4** | **CLIENT/SERVER NETWORK** |
| Client/Server Network Model: Concept – File Server – Printer Server – an e-mail Server. |
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| **Unit:5** | **DISTRIBUTED DATABASES** |
| Distributed Databases: An overview – Distributed Databases – Principles of Distributed Databases – Levels of Transparency – Distributed Database Design – The R\* Project Technique Problems of Heterogeneous Distributed Databases. |
|  |
| **Text Books** |
| 1 | John A. Sharp, “An Introduction to Distributed and Parallel Processing”, Blackwell Scientific Publications, 1987. |
| 2 | Uyless D. Black,“Data Communications & Distributed Networks”. |
| **Reference Books** |
| 1 | Joel M. Crichllow, “Introduction to Distributed & Parallel Computing”. |
| 2 | StefansCeri, GinseppePelagatti, “Distributed Databases Principles and systems”, McGraw Hill Book Co., New York, 1985. |



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| **Course code** | **EMBEDDED SYSTEMS** | **Elective** |
| **Pre-requisite** | Basics of micro controllers |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the introduction to embedded systems, Devices and Buses for Device Networks, Program modeling concepts, Inter – process communication & Synchronization of processes, Tasks andthreads
2. Enable the students learn the embedded systems concepts andfundamentals.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand embedded systems concepts |
| Understand RTOS concepts |
| Identify the devices and buses used in embedded networking |
| Analyze on software development process life cycle and its models |
| Analyze and design various real time embedded systems using RTOS |
|  |
| **Unit:1** | **INTRODUCTION** |
| Introduction to Embedded Systems: Embedded System – Processor in the system – Other hardware units – software embedded into a system – Exemplary Embedded systems – On chip and in VLSI Circuit. Processor and Memory selection for Embeddedsystems. |
|  |
| **Unit:2** | **NETWORKS** |
| Devices and Buses for Device Networks: I/O devices – Timer and counting Devices. Device Drivers and Interrupts Servicing Mechanism: Device drivers – Parallel Port device drivers in system – Serial Port device in a system – Device drivers for internal programmable timing devices – Interrupt servicing mechanism – context and the periods for context-switching, deadline and interruptlatency. |
|  |
| **Unit:3** | **PROGRAMMING MODELS** |
| Program modeling concepts in single & Multiprocessor systems software- Development Process: Modeling Processes for Software analysis before software Implementation – Programming models for event controlled or response time constrained real time programs – Modeling for microprocessor systems. Software Engineering Practices in the Embedded Software Development Process: Software algorithm complexity – Software Development process life cycle and its models – Software analysis – Software design – Software implementation – Software Testing,ValidatingandDebugging–Realtimeprogrammingissuesduringthesoftware |



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| development process – Software project management – Software maintenance – UML. |
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| **Unit:4** | **REAL TIME OPERATING SYSTEMS** |
| Inter – process communication & Synchronization of processes, Tasks and threads: Multiple processes in an application – Problem of sharing data by multiple tasks and routines – Inter Process communication. REAL TIME OPERATING SYSTEM:- Real time and Embedded systems operating systems – Interrupt routines in RTOS environment – RTOS Task scheduling models, Interrupt latency and Response times of the Tasks as performance Metrices – performance Metric in scheduling models for periodic, sporadic and Aperiodic Tasks – IEEE standard POSIX 1003.1b functions for Standardization of RTOS and Inter-task communication functions – List of Basic actions in a preemptive scheduler and Expected times taken at a processor – Filters – point strategy for synchronization between the processes, ISRs, OS functions and tasks and for Resource management – Embedded LinuxInternals. |
|  |
| **Unit:5** | **EMBEDDED SYSTEM** |
| Hardware – Software co-design in an embedded System: Embedded System Project Management– Embedded system design and co-design issues in system development processes – Design cycle in the development phase for an Embedded system – Uses of Target system, or its Emulator and In-circuit Emulator – Use of software tools for development of an embedded system – Use of scopes and logic analysis for system hardware tests – Issues in Embedded system designCase Study: An Embedded System for an Adaptive cruise control system in a car, embedded system for a smart card. |
|  |
| **Text Books** |
| 1 | Raj Kamal, “Embedded Systems – Architecture, programming and design”, Tata McGraw – Hill, 2003. |
| 2 | David E. Simon, “An Embedded Software primer” Pearson Education Asia, 2003. |
| **Reference Books** |
| 1 | Kenneth J Ayala, “The 8051 Microcontroller and Architecture programming and application”, Second Edition, PenramInternational. |



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| **Course code** | **WEB SERVICES** | **Elective** |
| **Pre-requisite** | Basics of distributed computing |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL ,UDDI
2. Get overview of Distributed Computing, XML, and itstechnologies
3. Update with QoS and itsfeatures
4. Develop Standards and future of WebServices
 |
|  |
| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand web services and its related technologies |
| Understand XML concepts |
| Analyze on SOAP and UDDI model |
| Demonstrate the road map for the standards and future of web services |
| Analyze QoS enabled applications in web services |
|  |
| **Unit:1** | **INTRODUCTION** |
| Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms. |
|  |
| **Unit:2** | **XML FUNDAMENTALS** |
| XML Fundamentals – XML documents - XML Namespaces- XML Schema –Processing XML. |
|  |
| **Unit:3** | **SOAP MODEL** |
| SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interfacedefinitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registrySpecification- Core data structures-Accessing UDDI |
|  |
| **Unit:4** | **TECHNOLOGIES AND STANDARDS** |
| Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management- workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues. |
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| **Unit:5** | **QUALITY OF SERVICE** |
| Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends. |
|  |
| **Text Books** |
| 1 | Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services: An Architects Guide”, Prentice Hall, Nov 2003. |
| 2 | Keith Ballinger, “NET Web services: Architecture and Implementation with .Net”, Pearson Education, First Education Feb 2003. |
| 3 | Ramesh Nagappan, Developing Java Web Services: Architecting and developing secure Web Services Using Java”, John Wiley and Sons, first Edition Feb 2003. |
| **Reference Books** |
| 1 | Eric A Marks and Mark J Werrell, “Executive Guide to Web services”, John Wiley and sons, March 2003. |
| 2 | Anne Thomas Manes, “Web Services: A managers Guide” Addison Wesley, June 2003. |
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| **Course code** |  | **MIDDLEWARE TECHNOLOGIES** | **Elective** |
| **Pre-requisite** | Basics of client server model and middlewares |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the overview of middleware technologies which plays important role in today’s technologies such as RPS, CORBA and webservices.
2. enable the students to learn the concept of middlewaretechnologies.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the motivation of using middleware |
| Understand how middleware facilitates the development of distributed applications in heterogeneous environments |
| Apply CORBA concepts |
| Analyze web services as most often used middleware technique |
| Make judgment in choosing a suitable middleware for application problems |
|  |
| **Unit:1** | **INTRODUCTION** |
| INTRODUCTION: Emergence of Middleware – Objects, Web Services – Middleware Elements– Vendor Architecture – Interoperability – Middleware in Distributed Applications – Types of Middleware – Transaction-Oriented Middleware – MOM – RPC. |
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| **Unit:2** | **MIDDLEWARE** |
| OBJECT ORIENTED MIDDLEWARE: OOM – Developing with OOM – Heterogeneity – Dynamic Object Request – Java RMI – COM+. |
|  |
| **Unit:3** | **CORBA** |
| CORBA: Naming – Trading – Life Cycle – Persistence – Security – CORBA. |
|  |
| **Unit:4** | **WEB SERVICES** |
| WEB SERVICES : Introduction – XML Web Services standards – Creating Web Services – Extending Web Services – Messaging Protocol – Describing – Discovering – Securing. |
|  |
| **Unit:5** | **TYPES OF MIDDLEWARE** |
| OTHER TYPES OF MIDDLEWARE : Real-time Middleware – RT CORBA – Multimedia Middleware – Reflective Middleware – Agent-Based Middleware – RFID Middleware. |
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| **Text Books** |
| 1 | Chris Britton and Peter Eye, “IT Architecture and Middleware”, Pearson Education, 2nd Edition, 2004. |
| 2 | Wolfgang Emmerich, “Engineering Distributed Objects”, John Wiley, 2000. |
| 3 | Keith Ballinger, “.NET Web Services – Architecture and Implementation”, Pearson Education, 2003. |
| **Reference Books** |
| 1 | Qusay H. Mahmoud, “Middleware for Communications”, John Wiley and Sons, 2004. |
| 2 | Gerald Brose, Andreas Vogel, Keith Duddy, “JavaTM Programming with CORBATM: Advanced Techniques for Building Distributed Applications”, Wiley, 3rd edition, January, 2004. |
| 3 | Michah Lerner, “Middleware Networks: Concept, Design and Deployment of Internet Infrastructure”, Kluwer Academic Publishers, 2000. |



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| **Course code** |  | **INFORMATION RETRIEVAL TECHNIQUES** | **Elective** |
| **Pre-requisite** | Basics of various forms of information and accessing methods. |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the introduction to retrieval of information from the web, various applications and querystructures.
2. Describe multimedia information retrievalprocess.
3. Enable the students to learn the basics of search operation on the web and itsapplications.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basic concepts and techniques in Information Retrieval |
| Analyze on querying languages used for IR |
| Identify the common text compression algorithms and their role in the efficient building and storage of inverted indices |
| Analyze on the various methods being followed to retrieve the contents from the web like text, image and multimedia contents |
| Acquire the necessary experience to design, and implement real applications us ing Information Retrieval system |
|  |
| **Unit:1** | **INTRODUCTION** |
| INTRODUCTION : Basic Concepts – Retrieval Process – Modeling – Classic Information Retrieval – Set Theoretic, Algebraic and Probabilistic Models – Structured Text Retrieval Models– Retrieval Evaluation –Word Sense Disambiguation. |
|  |
| **Unit:2** | **QUERY** |
| QUERYING: Languages – Key Word based Querying – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages. |
|  |
| **Unit:3** | **TEXT OPERATIONS AND USER INTERFACE** |
| TEXT OPERATIONS AND USER INTERFACE : Document Preprocessing – Clustering – Text Compression - Indexing and Searching – Inverted files – Boolean Queries – Sequentialsearching– Pattern matching – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points –Query Specification - Context – User relevance Judgment – Interface for Search. |
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| **Unit:4** | **MULTIMEDIA** |
| MULTIMEDIA INFORMATION RETRIEVAL : Data Models – Query Languages – Spatial |



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| Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction. |
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| **Unit:5** | **APPLICATIONS** |
| APPLICATIONS : Searching the Web – Challenges – Characterizing the Web – Search Engines– Browsing – Meta-searchers – Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models, Representations and Access – Prototypes and Standards. |
|  |
| **Text Books** |
| 1 | Ricardo Baeza-Yate, BerthierRibeiro-Neto, “Modern Information Retrieval”, Pearson Education Asia, 2005. |
| 2 | G.G. Chowdhury, “Introduction to Modern Information Retrieval”, Neal-Schuman Publishers; 2nd edition, 2003. |
| 3 | Daniel Jurafsky and James H. Martin, “Speech and Language Processing”, Pearson Education, 2000. |
| **Reference Books** |
| 1 | David A. Grossman, OphirFrieder, “ Information Retrieval: Algorithms, and Heuristics”, Academic Press, 2000 |
| 2 | Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, “Text Information Retrieval Systems”, Academic Press,2000. |
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| **Course code** |  | **INTERNET OF THINGS** | **Elective** |
| **Pre-requisite** | Basics of Sensors and its applications |
| **Course Objectives:** |
| The main objectives of this course are to:1. About Internet of Things where various communicating entities are controlled andmanaged for decision making in the applicationdomain.
2. Enable students to learn the Architecture of IoT and IoTTechnologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand about IoT, its Architecture and its Applications |
| Understand basic electronics used in IoT& its role |
| Develop applications with C using Arduino IDE |
| Analyze about sensors and actuators |
| Design IoT in real time applications using today’s internet & wireless technologies |
|  |
| **Unit:1** | **INTRODUCTION** |
| Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT |
|  |
| **Unit:2** | **BASIC ELECTRONICS FORIoT** |
| Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse WidthModulation. |
|  |
| **Unit:3** | **ARDUINO** |
| Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions. |
|  |
| **Unit:4** | **SENSORS AND ACTUATORS** |
| Sensors and Actuators: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino. |
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| **Unit:5** | **SENSOR IN INTERNETs** |
| Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak). |
|  |
| **Text Books** |
| 1 | ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-On Approach”, 2014. ISBN:978-0996025515 |
| 2 | Boris Adryan, DominikObermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017. |
| **Reference Books** |
| 1 | Michael Margolis, “Arduino Cookbook”, O‟Reilly, 2011 |
| 2 | Marco Schwartz, “Internet of Things with ESP8266”, Packt Publishing, 2016. |
| 3 | DhivyaBala, “ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”,2018. |



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| **Course code** | **PYTHONPROGRAMMING** | **Elective** |
| **Pre-requisite** | Basics of statistical programming. |
| **Course Objectives:** |
| The main objectives of this course are to:1. Presents an introduction to Python, creation of web applications, network applications and working in theclouds
2. Use functions for structuring Pythonprograms
3. Understand different Data Structures ofPython
4. Represent compound data using Python lists, tuples anddictionaries
 |
|  |
| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the basic concepts of Python Programming |
| Understand File operations, Classes and Objects |
| Acquire Object Oriented Skills in Python |
| Develop web applications using Python |
| Develop Client Server Networking applications |
|  |
| **Unit:1** | **INTRODUCTION** |
| **Python:** Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets– Comparison. |
|  |
| **Unit:2** | **CODE STRUCTURES** |
| **Code Structures:** if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions. |
|  |
| **Unit:3** | **MODULES, PACKAGES AND CLASSES** |
| **Modules, Packages, and Programs:** Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition. |
|  |
| **Unit:4** | **DATA TYPES AND WEB** |
| **Data Types:** Text Strings – Binary Data. **Storing and Retrieving Data:** File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores. |



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| **Web:** Web Clients – Web Servers – Web Services and Automation |
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| **Unit:5** | **SYSTEMS AND NETWORKS** |
| **Systems:** Files –Directories – Programs and Processes – Calendars and Clocks.**Concurrency:** Queues – Processes – Threads – Green Threads and gevent – twisted – Redis.**Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds. |
|  |
| **Text Books** |
| 1 | Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014. |
| 2 | Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013. |
| **Reference Books** |
| 1 | David M. Beazley,“Python Essential Reference”, Developer’s Library, Fourth Edition,2009. |
| 2 | SheetalTaneja,Naveen Kumar, ”Python Programming-A ModularApproach”,PearsonPublications. |



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| **Course code** | **DIGITAL IMAGE PROCESSING** | **Elective** |
| **Pre-requisite** | Basics of Image Processing and applications |
| **Course Objectives:** |
| The main objectives of this course are to:1. Learn basic image processing techniques for solving realproblems.
2. Gain knowledge in image transformation and Image enhancementtechniques.
3. Learn Image compression and Segmentationprocedures.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the fundamentals of Digital Image Processing |
| Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement |
| Apply, Design and Implement and get solutions for digital image processing problems |
| Apply the concepts of filtering and segmentation for digital image retrieval |
| Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner |
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| **Unit:1** | **INTRODUCTION** |
| Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations. |
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| **Unit:2** | **IMAGE ENHANCEMENT** |
| Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancementmethods. |
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| **Unit:3** | **IMAGE RESTORATION** |
| Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations. |
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| **Unit:4** | **IMAGE COMPRESSION** |
| Image Compression: Fundamentals – Image compression models – Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards. |
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| **Unit:5** | **IMAGE SEGMENTATION** |
| Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation. |
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| **Text Books** |
| 1 | Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education. |
| 2 | B. Chanda, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003. |
| **Reference Books** |
| 1 | Nick Efford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004. |



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| **Course code** |  | **NEURAL NETWORKS** | **Elective** |
| **Pre-requisite** | Basics of Neurons and Network |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the introduction to the basic neuron, Kohenen self- organizing network, hop field networks, associative memory,fuzzy.
2. Learn the pattern classification in NeuralNetworks.
3. Gain knowledge on the fuzzy relation andfuzzylogic.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand about soft computing techniques and their applications |
| Understand the pattern classification in Neural Networks |
| Analyze various neural network architectures |
| Analyze fuzzy relation and fuzzy logic & its applications |
| Apply and analyze fuzzy logic in real time applications |
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| **Unit:1** | **PATTERN CLASSIFICATION** |
| Pattern classification - Learning and Generalization - Structure of neural networks - ADA line, Delta rule - input output value - perceptions - Linear separability - Back propagation - XOR Function - Introduction to Boolean neural networks. |
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| **Unit:2** | **NETWORKS** |
| Hopfield Networks - Energy - The Hamming Network - RAM -Boltzmann machine - Instar, outstar network - ART - Kohonen's Network Recognition. |
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| **Unit:3** | **FUZZY RELATION** |
| Fuzzy relation - Member function - Fuzzy matrices - Fuzzy entropy - Fuzzy operation - Fuzzy composition. |
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| **Unit:4** | **FUZZY VARIABLES** |
| Fuzzy variables - Linguistic variables - Measure of fuzziness - Transition Matrix - Concept of Defuzzication and Applications |
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| **Unit:5** | **CASE STUDY** |
| CASE STUDY: Application of Neural Networks in character recognition, drug discovery, speech recognition; Application of Fuzzy logic concepts in Fuzzy controller design and Fuzzy querying |

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| in Relational databasemodel. |
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| **Text Books** |
| 1 | P.D.Wasserman, "Neural computing and practice", Van Nostran Reinhold, New York, 1991. |
| 2 | LiminFu,"NeuralNetworkin ComputerIntelligence",McGrawHill, International editions, 1994. |
| **Reference Books** |
| 1 | B Kosko, "Neural Network and Fuzzy systems", Prentice Hall,1996. |
| 2 | Klir& Yuan, "Fuzzy sets and Fuzzy logic", Theory and Applications, Prentice Hall of India, 1996. |



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| **Course code** | **ADVANCEMENTS IN INDUSTRY 4.0** | **Elective** |
| **Pre-requisite** | Basics of AI, Image Processing and Security |
| **Course Objectives:** |
| The main objectives of this course are to:1. Present the concepts and application of Machine learning, RPA, Cyber Security, Virtual Reality and Augmented Reality in variousdomains.
2. Learn current trends in ITindustry.
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| **Expected Course Outcomes:** |
| On the successful completion of the course, student will be able to: |
| Understand the drivers and enablers of Industry 4.0 |
| Learn about Cyber Security and Cyber-Systems from the industrial systems perspective |
| Analyze on purpose of Robotic Process Automation |
| Analyze on Virtual Reality-Based Enhance Manufacturing Sustainability inIndustry 4.0 |
| Analyze on Augmented Reality-Based Enhance Manufacturing Sustainability in Industry 4.0 |
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| **Unit:1** | **MACHINE LEARNING** |
| Machine Learning - Introduction – Definition – Types of Machine Learning –Supervised, Unsupervised, Reinforcement Learning – Algorithms for Machine Learning – Problems solved by Machine Learning - Tools for Machine Learning - Applications areas of MachineLearning |
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| **Unit:2** | **ROBOTIC PROCESS** |
| Robotic Process Automation (RPA): Introduction to RPA – Need for automation – Programming constructs in RPA – Robots and Softbots – RPA architecture and process methodologies - Industries best suited for RPA - Risks & Challenges with RPA |
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| **Unit:3** | **CYBER SECURITY** |
| Cyber Security: Cyber Crime and Information Security – Classification of Cyber Crimes - Types of Cyber Attacks - Cyber crime and Indian IT Act 2000 – Security Methods. |
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| **Unit:4** | **VRTUAL REALITY** |
| Virtual Reality: Definition – Types of Head Mounted Displays – Tools for Virtual Reality – Applications of VR in Education, Industries - Difference between VR and AR. |
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| **Unit:5** | **AUGMENTED REALITY** |
| Augmented Reality: Definition - Tools for Augmented Reality –Hololens - Advantages and |

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| Challenges of AR - Applications of AR in Education, Industries - Mixed Reality. |
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| **Text Books** |
| 1 | P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0, 2020. |
| **Reference Books** |
| 1 | AnandNayyar “A Roadmap to Industry 4.0: Smart Production, Sharp Business and Sustainable Development (Advances in Science, Technology & Innovation), Springer; 1st ed. 2020 |
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Annexure

**Master of Computer Applications**

**Syllabus**

**(With effect from 2020 -2021)**

**Program Code :**



**DEPARTMENT OF COMPUTER SCIENCE**

**Bharathiar University**

**(A State University, Accredited with “A“ Grade by NAAC and 13thRank among Indian Universities by MHRD-NIRF) Coimbatore 641 046, INDIA**

**BHARATHIAR UNIVERSITY, COIMBATORE 641046 DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS MISSION**

To impart Knowledge and Skill that develop Technical, Social, Economical, and Cultural values by providing a good Platform to Perform, acquiring Basic Practical Knowledge of various Fundamental Theoretical concepts and apply them successfully to meet the industrial needs globally with an attitude of Self upliftment andSociety.



Bridge Course

BharathiarUniversity , Coimbatore – 46 Bridge Course forMCA

(For students admitted from 2020-2021 onwards)

**Total Hours :60 hours** (Use PPT to enhance and Speed up the Teaching Learning Process and PPT can be used for FutureReferences)

## Goal:

The objective of bridge course is to provide the fundamental concepts and Practical knowledge about Computer Science and its Applications for students admitted from Non – Computer streams [with Mathematics at UG level or +2.]

## SubCodeSubject Name Theory Hrs Practical Hrs

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| --- | --- | --- | --- | --- |
| 01 | Basics of Digital Computer |  | 07 | -- |
| 02 | Data Structures and its applications Using | C |  |  |
| 2.1. Data Structure &Applications | ------ 06 | -- |
| 2.2. C Programming | ------ 07 | 10 |
| 03 Basics OOPS concepts usingC++ | 07 | 10 |
| 04 Basics of Computer Graphics and Multimedia | 07 | 6 |
| **Total** | **34** | **26** |

**Sub Code 01 Basics ofDigitalComputer (7Hours)**

Number System: Binary numbers, 4 – bit representation from (1 to 16) – Binary to Decimal, Decimal to Binary , Octal, Hexadecimal Conversions. Gray code and ASCII code-Addition, Subtraction ( 2’s complement) Logic Gates , Truth table , Half Adder, Full Adder, BCD Adder.

Boolean Algebra – Boolean Expression Simplification -Encoder, decoder, multiplexer, demultiplexer-Flip- Flops : RS ,J-K , D ,T, Master Slave, Registers , counters -Memory: Hierarchy, Types, Associative memory, match logic

## Sub Code 02 Data structure and its applications UsingC

* 1. **Data Structureanditsapplications (6 Hours**) Arrays – single and multi dimension - STACK and itsapplications like - Expression

Evaluation,Programming constructs - check for parity – Open / Close bracket; Begin / End; Subroutine calls / Returns; Nested loops etc. Linked lists , sorting lists , circularly linked lists. QUEUE and its applications like Process Scheduling, Priority Queue, Circular Queue. TREE and application of tree- FILES Importance of FILE data structure, FILE Operations , Types of files.

* 1. **CProgramming (7 Hours)** History and the importance of C as System programming and application programming -Variables, datatypes, operators and built- in functions - Input / Output statements, Control strings, escape sequences - Control structures -IF then else, Elseif Ladder, Switch case statements Loops – For loop, while, do while - Arrays, Structurers, Union, Pointers andFiles.

## C programming with DataStructuresLab (10 Hours)

( Lab session for C emphasized with data structure implementation. )

* + 1. Write a C program to sort the given list of numbers in ascending order and find greatestamong the list ofnumbers..
		2. Write a C program to convert INFIX notation to POSTFIX usingStack
		3. Write a C program to implement QUEUE operations accepting the choice for INSERTION, DELETION andEXIT
		4. Write a C program to find the result of a student (PASS / FAIL ) for 5 subjects in a class 0f60 students using structurevariable.
		5. Write a C Program to implement file operation. Related Programs may beadded.

## Sub Code : 03 Basic OOPS conceptsUsingC++ (10Hours)

Class, Object, encapsulation – inheritance - polymorphism – accesssspecifiers – scope – Variables, datatypes, - input/ output statements - control structures - branching and looping, control structures functions in C++-Member function, friend function, constructor, destructor, overloading.

## OOPS withC++Lab (10Hours)

1. Write a C++ program to implement friendfunction
2. Write a C++ program to implementInheritance
3. Write a C++ program to implement polymorphism with constructor anddestructor
4. Write a C++ program to implement operatoroverloading
5. Write a C++ program to implement function overloading . Related Programs may beadded.

## Sub code04 Basic concepts of GraphicsandMultimedia (7Hours)

Output Primitives - Attributes of output Primitives - 2D Transformations - Text – Audio – Video

## Basics of Graphics andMultimedia Lab (6Hours)

1. Write a program to implement 2DTransformation
2. Write a program to DrawLine
3. Write a program to move an object with soundeffect
4. Create an object and animate usingPhotoshop
5. Create a web page using Photoshop. Related Programs may beadded.