Bishop Heber College (Autonomous), Tiruchirappalli – 620 017
Department of Information Technology

Programme : M. Sc. (Information Technology)

PROGRAMME OUTCOMES

After successful completion of the M. Sc. (I. T.) Programme, the students will posses

PO No.	PROGRAMME OUTCOMES
PO1	**Extensive Knowledge :** Disseminate and demonstrate advanced knowledge in Information Technology and related disciplines by creating relevant real-time applications.
PO2	**Analytical & Scientific Reasoning :** Exhibit aptitudes to analyze, synthesize and interpret domain specific facts or data scientifically to determine the appropriate course of action.
PO3	**Critical Thinking :** Critically think and develop new techniques, evaluate practices and theories by following scientific approach to knowledge development.
PO4	**Problem Solving Skills :** Use the acquired academic competencies to solve diversified real time problems related with the area of study and its interlinked fields.
PO5	**Research Oriented Skills :** Ability to identify and define problems; organize, test, analyze, interpret and draw conclusions from the available data; in order to plan, execute and report the results of scientific experiments or investigations.
PO6	**Employability Skills and Team Work :** Able to work effectively by providing coordinated effort and act together as a team employing suitable communication, reliability and adaptability.
PO7	**Entrepreneurial and Leadership Qualities :** Exhibit suitable managerial skills to influence and lead the people in the right direction smoothly and efficiently.
PO8	**Ethical and Social Responsibilities :** Appreciate and embrace moral values in life and follow ethical practices in every social and professional ventures.
PO9	**Self-Directed and Lifelong Learning :** Aptitude to handle every professional or personal role independently and efficiently by diligent acquisition of knowledge and skills throughout the life.

PROGRAMME SPECIFIC OUTCOMES

After successful completion of the M. Sc. (I. T.) Programme, the students will posses

PO No.	PROGRAMME SPECIFIC OUTCOMES
PSO1	**Domain Specific Knowledge :** Exhibit understanding in the principles and techniques employed for acquiring, storing, retrieving, processing and disseminating Information with the aid of core knowledge in Object Oriented Techniques, Operating Systems, Networking and Database Concepts.
PSO2	**Application Design and Development Expertise :** Apply the concepts of Programming along with Database, Networking and Operating Systems to design and develop variety of Web and Mobile based Applications with suitable Programming Languages, tools and techniques for diversified platforms with the aid of software blueprints by integrating the concepts of Unified Modeling Language, Software Engineering and Object Oriented Approach.
PSO3	**Research Aptitude :** Predict the possible threats or problems and recommend remedial measures for various issues related with Network Security, Protocols and Architecture and also to provide integrated solutions for real time oriented problems involving Internet of Things, Cloud Computing, Data Science, Artificial Intelligence and Machine Learning.
PSO4	**Current Technical Exposure :** Familiarize and enhance the knowledge in recent technologies such as Network Security, Cyber Crimes, Computer Forensics, Cyber Laws, Internet of Things, Cloud Computing, Data Science, Artificial Intelligence, Human Computer Interaction and Machine Learning.

Bishop Heber College (Autonomous), Tiruchirappalli – 620 017
M. Sc. (Information Technology)
(Syllabus applicable to the students admitted from the academic year 2022 – 2023 onwards)

Eligibility: B.C.A. or B. Sc. Computer Science or B. Sc. Information Technology or B. Sc. Software Development or any other degree with Mathematics as an allied/major subject or with Mathematics or Computer Science or Business Mathematics or Statistics at + 2 level.

Sem	Course	Course Title	Course Code	Hours Per Week	Credits	CIA	ESE	TOTAL
I	Core I	Object Oriented Programming with Java	P21IT101	5	5	25	75	100
	Core II	Relational Database Systems	P21IT102	5	5	25	75	100
	Core III	Advanced Operating Systems	P21IT103	5	5	25	75	100
	Core Prac.-I	Java Programming Lab	P21IT1P1	6	4	40	60	100
	Core Prac.-II	Relational Database Systems Lab	P21IT1P2	5	3	40	60	100
	Elective–I	Multimedia Technologies	P21IT1:1	4	4	25	75	100
		Computer Graphics	P21IT1:A					
		Digital Image Processing	P21IT1:B					
II	Core IV	Data Communication Networks	P21IT204	4	4	25	75	100
	Core V	Web Programming	P21IT205	4	4	25	75	100
	Core VI	Mobile Technologies	P21IT206	4	4	25	75	100
	Core Prac.-III	Web Programming Lab	P21IT2P3	4	2	40	60	100
	Core Prac.-IV	Mobile Applications Development Lab	P21IT2P4	4	2	40	60	100
	Elective–II	Unified Modeling Language /	P21IT2:2	4	4	25	75	100
		Object Oriented Analysis and Design /	P21IT2:A					
		Principles of User Experience Design	P21IT2:B					
	Elective - III	Cryptography and Network Security /	P21IT2:3	4	4	25	75	100
		Cyber Crimes and Computer Forensics /	P21IT2:C					
		Cyber Laws and its Applications	P21IT2:D					
	VLO	RI/MI	P22VLO2:1/ P22VLO2:2	2	2	25	75	100
III	Core VII	Programming with Python	P21IT307	5	5	25	75	100
	Core VIII	Internet of Things	P21IT308	5	5	25	75	100
	Core IX	Cloud Computing	P22IT309	4	4	25	75	100
	Core Prac.- V	Python Programming Lab	P21IT3P5	6	4	40	60	100
	Core Prac.-VI	Internet of Things Lab	P21IT3P6	5	3	40	60	100
	Elective–IV	Software Engineering /	P21IT3:4	4	4	25	75	100
	Elective–IV	Software Testing /	P21IT3:A	4	4	25	75	100
		Software Project Management	P21IT3:B	4	4	25	75	100
	Generic course	Sustainable Development Goals	P22IT3G1	1	1	25	75	100
IV	Core X	Big Data Analytics	P21IT410	6	5	25	75	100
	Elective–V	Machine Learning	P21IT4:5	4	4	25	75	100
	Elective–V Core Project	Soft Computing	P21IT4:A	4	4	25	75	100
		Human Computer Interaction	P21IT4:B	4	4	25	75	100
		PROJECT WORK	P21IT4PJ	--	5	40	60	100

Core Theory   : 10   Electives   : 5   Total Credits   : 90

Core Practical   : 6   Core Project   : 1   Value Education   : 1f22f

M. Sc. [Information Technology] – Semester - I
Core Course – I : OBJECT ORIENTED PROGRAMMING WITH JAVA

COURSE CODE : P21IT101   **HOURS PER WEEK : 5**
CREDITS   : 5   **TOTAL HOURS   : 75**

COURSE OBJECTIVES :
To obtain programming experience and problem solving expertise with exposure to Object Oriented Programming techniques and other facilities available in JAVA and to develop efficient and user-friendly Java based Applications for standalone and distributed environments.

COURSE OUTCOMES :
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Illustrate the concepts of Object Oriented Programming.	K2	I
CO2	Develop Packages and Interfaces	K3	I
CO3	Experiment with the methods for handling Events and Exception.	K3	II
CO4	Classify and Compare the Collection classes and interfaces	K4	III
CO5	Interpret and Compare the Applet class with AWT and swing controls.	K5	IV
CO6	Build Java based Applications with Database Connectivity	K6	V

UNIT - 1
Fundamentals of Object Oriented Programming – Overview of JAVA Language – **Introduction to Classes** – Class Fundamentals – Declaring Objects – Constructors – Methods – Overloading Methods – Inner Classes – Inheritance – Method Overriding – **Packages – Interfaces**

UNIT - 2
Exception Handling – Types of Exceptions – Try and Catch – Nested Try – Throw and throws – **Multithreading** – Thread Priorities – Main thread – Synchronization.

UNIT - 3
The Collections Framework: The Collection Interfaces-The collection Classes –Accessing a Collection via an Iterator - Storing User-Defined Classes in Collections - Working with Maps - The Legacy Classes and Interfaces.

UNIT - 4
Applet class – Applet Architecture – The HTML Applet tag – Passing parameters in Applets- AWT classes – Window fundamentals – AWT controls – Layout Managers - Menus. **Swing**: JApplet-Icons and Labels-TextFields-Buttons-Combo Boxes-Tabbed Panes-ScrollPanes-Tables-Trees.

UNIT - 5
Java Database Connectivity – Java Remote Method Invocation (RMI) – Java Servlets: JSDK – The Servlet API – Life Cycle of a Java Servlet – Creating Servlets.

TEXT BOOKS:
1. Herbert Schildt, **"JAVA 2 Complete Reference"**, 4th Edition, TMH Publications, 2001. **(for Units 1 to 4)**
2. Ivan Bayross, **"JAVA 2.0 (Web enabled commercial application development)"**, BPB Publications, 2000. **(for Unit 5)**

REFERENCE BOOKS:
1. Kathy Sierra, Bert Bates, **"Head First Java"**, 2nd Edition, O'Reilly Media, 2005.
2. E. Balagurusamy, **"Programming with Java A Primer"**, 5th Edition, McGraw Hill, 2014.

M. Sc. [Information Technology] – Semester - I
Core Course – II : RELATIONAL DATABASE SYSTEMS

COURSE CODE : P21IT102   **HOURS PER WEEK : 5**
CREDITS   : 5   **TOTAL HOURS   : 75**

COURSE OBJECTIVES :
To understand the popular Relational Database System concepts and techniques.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Choose a suitable relational data base system to develop real life applications using the available data base system concepts, models and techniques.	K1	I
CO2	Illustrate the use of SQL Queries and different SQL statements	K2	II
CO3	Make use of Domain Constraints and Integrities.	K3	III
CO4	Analyze different Normal Forms and their issues	K4	III
CO5	Evaluate File Organizations, Storage, Structure, Indexing and Hashing	K5	IV
CO6	Build Transaction Management mechanisms for efficient data transfer in SQL.	K6	V

UNIT - 1
Introduction: Database system Applications – Database systems Vs File Systems – View of data – Data models – Database languages – Database users & Administrators – Transaction Management – Database system structure – Application Architectures. Entity – Relationship model : Basic concepts – constraints – keys – Design issues – Entity – Relationship Diagram – Weak entity sets – Extended E-R Features – Design of an E-R Database schema – Reduction of an E-R schema to Tables.

UNIT – 2
Relational Model : Structure of Relational Databases – The Relational Algebra – Extended relational algebra operations – Modification of the Database – Views – Relational Databases : SQL – Background – Basic structure – set operations – Aggregate functions – Null Values – Nested subqueries – Views – Complex Queries – Modification of the Database – Joined relations – Data – Definition Language – Embedded SQL – Dynamic SQL – other SQL features.

UNIT - 3
Integrity and security : Domain constraints Referential Integrity – Assertions – Triggers – Security and Authorization – Authorization in SQL – Encryption and Authentication. - Relational Database Design : First Normal form – pitfalls in Relational Database Design – Functional Dependencies – Decomposition – Desirable properties of Decomposition – Boyce – Codd Normal form – Third Normal Form – Fourth Normal Form – More normal forms – overall Database Design process.

UNIT - 4
Storage and file structure : Overview of physical storage media – Magnetic Disks – RAID – Tertiary storage – Storage Access – File organization – organization of records in files – Dictionary storage. - Indexing & Hashing: Basic concepts–ordered Indices – B+-Tree Index files–Static Hashing–Dynamic Hashing–Comparison of ordered indexing & Hashing–Index definition in SQL–Multiple–key access.

UNIT - 5
Transaction Management-Transactions-Concept–Transaction state–Implementation of Atomicity and Durability–Concurrent executions–Serializability–Recoverability– Implementation of Isolation– Transaction Definition in SQL – Testing for serializability. - Concurrency control : Lock – Based Protocols – Timestamp – Based protocols – Validation – Based Protocols – Multiple Granularity – Multiversion schemes – Deadlock handling – Insert and Delete operations – Weak levels of consistency – Concurrency in Index structures.

TEXT BOOK :
1. Abraham Silbercharz, Henry F. Korth and S. Sudharshan- **"Database System Concepts"** McGraw Hill International -4th edition 2006. (Chapters: 1,2,3,4,6,7,11,12,15,16)

REFERENCE BOOK :
1. Atul Kahate, **"Introduction to Database Management Systems"**, 1st Indian Reprint, Pearson Education, Delhi, 2004.

M. Sc. [Information Technology] – Semester - I
Core Course – III : ADVANCED OPERATING SYSTEM

COURSE CODE : P21IT103   **HOURS PER WEEK : 5**
CREDITS   : 5   **TOTAL HOURS   : 75**

COURSE OBJECTIVES :
To know the concepts and functions of Operating Systems used in modern Computing Systems.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Classify different types of Operating Systems and indicate their pros and cons.	K2	I
CO2	Identify the algorithms used for CPU Scheduling and denote their performance.	K3	II
CO3	Examine the issues related with Deadlock and solve problems associated with Resources allocation in order to find whether a system in the Safe state or not.	K4	II
CO4	Inspect various memory management techniques and asses the use of virtual memory.	K4	III
CO5	Explain the design issues of Distributed Operating Systems and discuss the pros and cons of various communication mechanisms employed.	K5	IV
CO6	Discuss the applications of Real time Operating Systems and determine the scheduling algorithms employed.	K6	V

UNIT – 1
Operating System Overview: - Operating system overview-objectives and functions- Evolution of Operating System.- OS Generation – Types of operating System- Batch Processing System- Multiprocessor System- Distributed System- Clustered System- Real Time System- Time Sharing System-Feature Migration- Computing Environments.

UNIT – 2
Process Management: - Processes – Process Concept and Life cycle- Process Scheduling- Inter-process Communication- CPU Scheduling – Scheduling algorithms- Process Synchronization – Critical-Section Problem- Semaphores- Critical regions - **Deadlock** –Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.

UNIT – 3
Memory Management: - Basic Memory Management: - Definition- Address map- Memory allocation- Internal and External fragmentation and Compaction- Paging: Principle of operation – Page allocation. - **Virtual Memory:** Basics of Virtual Memory – Locality of reference, Page fault - Demand paging – Page Replacement policies.

UNIT – 4
Distributed Operating System: - Introduction: - Distributed Computing Systems – Models - Issues in Designing - **Message Passing:** Introduction, Features - Issues in IPC- Synchronization- Buffering, Process Addressing, Failure Handling, Group Communication-Remote Procedure Calls**:** Model- , Implementation- Case Study: Sun Network File System,

UNIT – 5
Real Time Operating System: - Real Time Systems: Introduction- Examples- Architectures, RTOS building blocks Classification-Safety and Reliability- Design issues-CPU Scheduling, scheduling criteria-scheduling algorithms-real-time garbage collection- Case study Linux POSIX system- Traffic Light Controller System.

TEXT BOOKS :
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design", PHI, 2007.
3. Jane W. S. Liu, "Real-time systems", Prentice Hall, 2000.

REFERENCE BOOKS :
1. Andrew S. Tanenbaum, "Modern Operating Systems", 2nd Edition, Pearson Education, 2004.
2. Andrew S Tannebaum, "Distributed Operating Systems", Pearson Education, 2009.

M. Sc. [Information Technology] – Semester - I
Core Practical Course – I : JAVA PROGRAMMING LAB

COURSE CODE : P21IT1P1   HOURS PER WEEK : 6
CREDITS   : 4   TOTAL HOURS   : 90

COURSE OBJECTIVES :
To attain experience in Object Oriented Programming with the facilities available in JAVA.

COURSE OUTCOMES
After the successful completion of this course, the students will be able to

CO. No.	Course Outcomes	Level	Exercise
CO1	Build the programming elements, their object scope and access.	K3	1
CO2	Experiment with the code reusability and inheritance.	K3	2 – 4
CO3	Utilize constructor overloading, packages and interfaces	K4	5 – 6
CO4	Construct the code to handle Built-in and User-defined Exceptions and Multithreading	K5	7 – 8
CO5	Write Programs using Collections Classes, Interfaces and Applets.	K5	9 – 10
CO6	Develop database applications with AWT controls.	K6	11 – 13

Ex. No.	Exercise
1	Preparation of Student Mark List using Classes and Objects
2	Preparation of Electricity Bill using Single Inheritance
3	Program to display Product Details using Multilevel Inheritance
4	Program to prepare Pay Bill using Hierarchical Inheritance
5	Program to calculate areas of different shapes using Interfaces
6	Program to perform arithmetic operations using Packages
7	Program to implement User Defined Exceptions
8	Program to apply the concept of Multithreading in Bank Transactions.
9	Program to add elements through Collection Methods
10	Program to move a ball using Applet
11	Program to develop a simple calculator using AWT controls.
12	Program to create a Login Module using Swing.
13	Establishing Database Connection to create and manipulate employee records using JDBC

M. Sc. [Information Technology] – Semester - I
Core Practical Course – II : RELATIONAL DATABASE SYSTEMS LAB

COURSE CODE : P21IT1P2   HOURS PER WEEK   : 5
CREDITS   : 3   TOTAL HOURS   : 75

COURSE OBJECTIVES :
To obtain hands on experience in working with essential facilities available in popular RDBMS software.

COURSE OUTCOMES
After the successful completion of the course, the student will be able to

CO. No.	Course Outcomes	Level	Exercise
CO1	Build DML and DDL statements in DBMS.	K3	1-2
CO2	Construct SQL Queries to perform different operations with Tables.	K3	3
CO3	Experiment with Built-in Functions, Complex and Nested queries in SQL.	K3	4-5
CO4	Distinguish Creation of Views and Indexes	K4	6
CO5	Employ Functions, Procedures, Exceptions, Cursors and Triggers in PL/SQL.	K5	7-11
CO6	Develop Applications using PL/SQL.	K6	12

Ex. No.	Exercise
1	Create a Student Table to perform DDL operations
2	Create an Employee Table to perform DML operations
3	Create customers and suppliers table queries using WHERE, HAVING, LIKE and BETWEEN clauses. Apply Logical and Set Operations in the above table.
4	Create an Orders Table and apply different types of Joins to perform sub queries and nested queries.
5	Usage of Built-in function in SQL.
6	Usage of Indexes, Creating Views and querying in Views.
7	Write a Program to implement Functions in PL/SQL.
8	Write a Program to implement Procedures in PL/SQL.
9	Write a Program to implement Cursors in PL/SQL.
10	Write a Program to implement Triggers in PL/SQL.
11	Write a Program to implement Exceptions in PL/SQL.
12	Develop PL/SQL programs to prepare EB bill by performing splitting and merging of tables.

M. Sc. [Information Technology] – Semester - I
Elective Course – IA : MULTIMEDIA TECHNOLOGIES

COURSE CODE : P21IT1:1   **HOURS PER WEEK : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To acquire the basic knowledge required to work with various components of multimedia such as text, graphics, animation, audio and video.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define the technical aspects of Multimedia Systems.	K1	I
CO2	Demonstrate various Multimedia database applications in real time.	K2	I
CO3	Identify the importance of Compression and Decompression techniques and various Data and File Standards.	K3	II
CO4	Explain the Multimedia Applications Design and the components of Multimedia Systems.	K4	III
CO5	Interpret the concepts of Multimedia Authoring and User Interface.	K5	IV
CO6	Elaborate Hypermedia Messaging and Integrated Multimedia Messaging Standards	K6	V

UNIT - 1
Overview of Multimedia Systems Design : - Multimedia Elements - Multimedia Applications - Documenting Imaging - Image Processing and Image Recognition - Full-Motion Digital Video Application - Electronic Messaging - **Evolving Technologies for Multimedia Systems:** - Multimedia Data Interface Standards -**Multimedia Databases:** - Multimedia Storage and Retrieval – DBMS for Multimedia Systems – DB Organization for Multimedia Applications - Transaction Management for Multimedia Systems.

UNIT - 2
Compression and Decompression: - Types of Compression - Lossless Compression - Lossy Compression - Color, Gray Scale and Still-Video Image Compression - Audio Compression - **Data and File Format Standards:** - Rich-Text Format - TIFF File Format - Resource Interchange File Format - MIDI File Format - JPEG File Format for Still and Motion Images.

UNIT - 3
Multimedia Application Design: - Multimedia Applications Classes - Game Systems - Multimedia Repositories - Interactive TV using set-top systems - Types of Multimedia Systems - Virtual Reality Design - Human Factors - Multimedia Inputs and Outputs - Modeling – Design Considerations - **Components of Multimedia Systems**: - Input-Output-Storage Systems - Application Workflow Design Issues - Distributed Application Design Issues.

UNIT - 4
Multimedia Authoring and User Interface: - Multimedia Authoring Systems - Design Issues for Multimedia Authoring - Approaches to Authoring - Types of MM Authoring - **Hypermedia Application Design Considerations:** - Integration of Application - Data Exchange – User Interface Design - Navigation Through the Application - Special Metaphors for Multimedia Applications - Information Access.

UNIT - 5
Hypermedia Messaging: - Mobile Messaging - Hypermedia Message Components - Text - Rich-Text - Voice Messages - Full-Motion Video Management - Hypermedia Linking and Embedding - Creating Hypermedia Messages – **Integrated Multimedia Message Standards:** - Vendor-Independent Messaging - MAPI Support- Telephony API - Internet Messaging - Integrated Document Management.

TEXT BOOKS :
1. Prabhat K. Andleigh, Kiran Thakrar, "**Multimedia Systems Design"**, PHI ,New Delhi,2002.

REFERENCE BOOKS :
1. Ze-Nian Li, Mark S. Drew, **"Fundamentals of Multimedia"**, Pearsons Education, New Delhi, 2005.
2. John F. Koegel Bufford, **"Mutimedia Systems"**, Pearson Education, Delhi, 2005.
3. David Hillman, **"Multimedia Technology & Applications"**, Galgotia Publications, New Delhi, 2010.

M. Sc. [Information Technology] – Semester - I
Elective Course – IB : COMPUTER GRAPHICS

COURSE CODE	**: P21IT1:A**	**HOURS PER WEEK**	**: 4**
CREDITS	**: 4**	**TOTAL HOURS**	**: 60**

COURSE OBJECTIVES :
To understand the concepts, techniques and applications of Computer based Graphics.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Choose the algorithms to scan, convert the basic geometrical primitives, transformations, Area filling and clipping.	K1	I
CO2	Explain the applications, principles and the commonly used techniques of Computer Graphics and the algorithms for line drawing, circle and ellipse generating.	K2	I
CO3	Make use of simple 2D graphics with lines, curves and can implement algorithms to rasterizing simple shapes, fill and clip polygons.	K3	II
CO4	Analyze the techniques for representing geometrical objects, Transformations and 3D viewing.	K4	III
CO5	Determine the concepts of lighting and shading models, textures, ray tracing, hidden surface elimination.	K5	IV
CO6	Build projected objects to naturalized the scene in 2D view and use of illumination methods and color models	K6	V

UNIT - 1
Output Primitives: Points and Lines - Line Drawing algorithms - Loading frame Buffer - Line function - Circle Generating algorithms - Ellipse – generating algorithms. - **Attributes of Output Primitives:** Line Attributes - Curve attributes - Color and Grayscale Levels - Area fill attributes.

UNIT - 2
2D Geometric Transformations: Basic Transformations – Matrix representations - Composite Transformations-Other Transformations. **2D Viewing :** The Viewing pipeline - Viewing coordinate Reference Frame-Window to viewport Coordinate Transformation-2D Viewing Functions-Clipping Operations-Point, Line, Polygon, Curve, Text and Exterior Clippings.

UNIT - 3
3D Concepts :3D Display Methods -3D Graphics Packages. 3D Object Representations: Polygon Surfaces-Curved lines and Surfaces-Quadric Surfaces-Super quadrics-Blobby Objects-Spline representations **3D Geometric Modeling and Transformations:** Translation-Rotation-Scaling-Other Transformations – Composite Transformations -3D Transformation functions.

UNIT - 4
Variable Surface Detection Methods: Classification of Visible–Surface algorithms-Back-Face Detection–Depth Buffer Method-A Buffer method – Scan –Line Method-Depth-Sorting Method-BSP-Tree Method-Area-Subdivision Method-Ray casting Methods-Curved surfaces-Wireframe Methods-Visibility-Detection functions.

UNIT - 5
Illumination Methods: Properties of Light-Standard Primaries at the Chromaticity Diagram-Intuitive color Concepts-RGB   Color Model - YIQ Color Model - CMY Color Model-HSV Color Model –Conversion between HSV and RGB models - Color selection Applications.

TEXT BOOK:

1. Donald D. Hearn, M. Pauline Baker, **"Computer Graphics"**, 2nd edition, Pearson Education, 2002.

REFERENCE BOOK:
1. William M. Newman, Robert F. Sproull, **"Principles of Interactive Computer Graphics"**, 2nd edition,
    TMH Publications, 2001.

M. Sc. [Information Technology] – Semester - I
Elective Course – IC : DIGITAL IMAGE PROCESSING

COURSE CODE : P21IT1:B   **HOURS PER WEEK : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To acquire the basic knowledge required to work with digital images processing

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Illustrate the fundamental concepts of digital image processing systems.	K2	I
CO2	Choose images in the frequency domain using various transforms.	K3	II
CO3	Make use of different types of image transforms and their properties.	K3	II
CO4	Analyze the techniques for image enhancement and image restoration.	K4	III
CO5	Justify the need for compression and to evaluate the use of Spatial and Frequency domain techniques of image compression.	K5	IV
CO6	Formulate Image Segmentation and Representation.	K6	V

UNIT - 1
Digital Image Fundamentals: Digital image, applications of digital image processing- elements of digital image processing-digital camera, line scan CCD sensor – display element perception – luminance – brightness, contrast- color models – RGB, CMY, HSI -Fourier transforms.

UNIT - 2
Image Transform: Properties of Unitary transform – 2D DFT – DCT- Discrete wavelet transform-Hotelling Transform – SVD transform – Slant, Haar transforms.

UNIT - 3
Image Enhancement and Restoration: Contrast stretching – intensity level slicing – Histogram equalization – spatial averaging – smoothing – Median filtering – non linear filters – maximum , minimum, geometric mean – edge detection – degradation model –unconstrained and constrained filtering – removal of blur –Wiener filtering.

UNIT - 4
Image Compression: Huffman‟s coding- truncated Huffman‟s coding – binary codes, arithmetic coding, run length coding- transform coding – JPEG and MPEG coding.

UNIT - 5
Image Segmentation: Pixel based approach – Feature threshold – choice of feature – optimum threshold – threshold selecting method- region based approach – region growing – region splitting – region merging.

TEXT BOOKS :
1. Jayaraman S, Esakkirajan S., Veerakumar T., **"Digital Image Processing"**, Tata McGraw Hill Education Private Limited.
2.   Gonzalez R.C and Woods R. E, **"Digital Image Processing"** Addison Wesley 2. Anil K Jain Fundamentals of Digital image processing, Prentice Hall.

REFERENCE BOOKS:
1. S. Annadurai, R. Shanmugalakshmi, **"Fundamentals of Digital Image Processing"**, Pearson Education.
2. Anil. K. Jain, **"Fundamentals of Image Processing"**, Prentice Hall.
3.   Maher A., Sid Ahmad, **"Image Processing-Theory, Algorithms and Architectures"**, McGraw Hill Education Private Limited.

M. Sc. [Information Technology] – Semester - II
Core Course – IV : DATA COMMUNICATION NETWORKS

COURSE CODE : P21IT204   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To Understand the Characteristics, Specifications, Standards, Protocols and Techniques of the modern Computer based Communication Systems.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define Data Communications Systems and their components and relate the different types of transmission media with real time applications.	K2	I
CO2	Identify the occurrence of errors and apply error detection and correction mechanisms suitably	K3	II
CO3	Distinguish various multiplexing techniques in data transmission.	K4	II
CO4	Examine the switching mechanisms and the intrigues of ATM.	K4	III
CO5	Determine the routing protocols, assign IP addresses for the given network and to establish congestion control techniques.	K5	IV
CO6	Develop Computer Networking Systems utilizing the standard protocols available.	K6	V

UNIT - 1
Overview: A Communication model - Data Communications – Networks – The Internet – **Protocol Architecture:** The need for a Protocol Architecture – The TCP/IP protocol Architecture. – The OSI Model – Standardization within a Protocol Architecture - **Data Transmission**: Concepts & terminology–Analog & Digital Data Transmission – Transmission Impairments **Guided & Wireless Transmission:** Guided Transmission Media – Wireless Transmission – Wireless Propagation.

UNIT - 2
Digital Data Communication Techniques: Asynchronous and Synchronous Transmission – Types of Errors– Error Detection –Error Correction- **Data Link Control Protocols**: Flow Control– Error Control– High Level Data Link Control (HDLC) - **Multiplexing**: Frequency Division Multiplexing – Synchronous Time Division Multiplexing – Statistical Time Division Multiplexing – Asymmetric Digital Subscriber Line – xDSL.

UNIT - 3
Circuit Switching and Packet Switching: Switched Communications Networks–Circuit Switching Networks –Circuit Switching Concepts–Packet Switching Principles–X.25–Frame Relay **Asynchronous Transfer Mode:** Protocol Architecture – ATM Logical Connections – ATM Cells – Transmission of ATM Cells – ATM Service Categories.

UNIT - 4
Routing in Switched Networks : Routing in Packet Switching Networks **–** Least Cost Algorithms. **Congestion Control in Data Networks:** Effects of Congestion – Congestion Control - Traffic Management. **Local Area Networks – LAN Overview:** Background – Topologies and Transmission Media – LAN Protocol Architecture – Bridges – Layer2 and Layer3 Switches.

UNIT - 5
Communication Architecture and Protocols: - Internetwork Protocols: Basic Protocol Functions – Principles of Internetworking – Internet Protocol Operation – Internet Protocol – IPV6. - **Transport Protocols:** Connection Oriented Transport Protocol Mechanisms – TCP – UDP. **Internet Applications :** Electronic Mail – SMTP and MIME – Network Management (SNMP) – Internet Directory Service – Web Access - HTTP.

TEXT BOOK:
1.   William Stallings, **"Data and Computer Communications"**, 8th Edition**,** Pearson Education, 2007.

REFERENCE BOOKS:
1. Behrouz A. Forouzan, **"Data Communications and Networking"**, 4th Edition, Tata McGraw Hill Publishing Company, 2006.
2. Andrew S.Tannenbaum, David J.Wetherall, **"Computer Networks"**, 5thEdition, Pearsons Education, 2011

M. Sc. [Information Technology] – Semester - II
Core Course – V : WEB PROGRAMMING

COURSE CODE : P21IT205		**HOURS PER WEEK : 4**
CREDITS : 4		**TOTAL HOURS : 60**

COURSE OBJECTIVES :
To acquire knowledge in using HTML, XHTML, CSS, JavaScript, JQuery, and .NET Web Programming.

Course Outcomes:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Demonstrate web page creation using HTML and its extensions	K2	I
CO2	Identify the concepts of CSS and JavaScript	K3	II
CO3	Apply the jQuery and AJAX concepts in database	K3	III
CO4	Distinguish .NET framework and C# basic concepts	K4	III
CO5	Explain Classes and Class Members in C#	K5	IV
CO6	Construct Web services and Deploy web based programs	K6	V

UNIT - 1
HTML and XHTML: Structuring Documents for the Web - Links and Navigation - Images, Audio, and Video – Tables – Forms – Frames.

UNIT - 2
CSS and JavaScript: Cascading Style Sheets - More Cascading Style Sheets - Learning JavaScript - Working with JavaScript – HTML5.

UNIT - 3
JQuery and C#: Introduction to jQuery - Selecting and Filtering – Events - Arrays and Iteration – AJAX. **Introducing C#:** What is the .NET Framework? - What is C#? Writing a C# Program – Variables and Expressions – Flow Control – Functions.

UNIT - 4
Defining Classes: Class Definitions in C# - System Object – Constructors and Destructors. **Defining Class Members:** Member Definitions – Interface Implementation.

UNIT - 5
Web Programming: ASP.NET Web Programming – Web Services – Deploying Web Applications.

TEXT BOOKS :
1. Jon Duckett, "**Beginning HTML, XHTML, CSS, and JavaScript**", Wiley Publishing Inc. 2010. (for unit 1)
2. Richard York, "**Beginning JavaScript and CSS Development with JQuery**", Wiley Publishing Inc., 2009. (for unit 2, 3)
3. Karli Watson, Christian Nagel, Jacob Hammer Pedersen, Jon Reid, and Morgan Skinner, "**Beginning Visual C# 2010**", Wiley Publishing, Inc., 2010. (for units 3, 4 & 5)

REFERENCE BOOKS:
1. Matt J. Crouch **"ASP.NET and VB.NET Web Programming"**, Pearson Education. 2010.
2. Matthew Mac Donald, **"ASP.NET:-The Complete Reference"**, TMH, New Delhi, 2002

M. Sc. [Information Technology] – Semester - II
Core Course – VI : MOBILE TECHNOLOGIES

COURSE CODE : P21IT206		**HOURS PER WEEK : 4**	
CREDITS : 4		**TOTAL HOURS : 60**	

COURSE OBJECTIVES :
To impart knowledge on the working of mobile communication systems and to acquire expertise in application development for Mobile Computing systems.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define Mobile Telecommunication networks and wireless communication system.	K1	I
CO2	Demonstrate the understanding of mobile computing and wireless networking.	K2	II
CO3	Compare mobile databases for the best fit transaction process in mobile environment.	K3/K4	III
CO4	Categorize various Mobile Operating Systems.	K4	IV
CO5	Determine the android application with suitable User Interface and data manipulation.	K5	1V
CO6	Develop Applications for Android Devices includes content providers and networking.	K6	V

UNIT - 1
Basics of Communication Technologies : Types of Telecommunication Networks – Components of a Wireless Communication System–Architecture of Mobile Telecommunication Systems–Wireless Networking Standards– WLAN–Bluetooth Technology–**Introduction to Mobile Computing and Wireless Networking :** Mobile Computing–Mobile Computing Vs. Wireless Networking–Characteristics of Mobile Computing-Structure of Mobile Computing Applications–Cellular Mobile Communication–GSM–GPRS–UMTS.– **MAC Protocols :** Properties– Issues– Taxonomy–Assignment Schemes– MAC Protocols for Ad Hoc Networks.

UNIT - 2
Mobile Internet Protocol : –Mobile IP–Packet Delivery–Overview– Desirable Features– Key Mechanism–Route Optimization– DHCP - **Mobile Transport Layer :** Overview of TCP/IP –Terminologies– Architecture – Operations – Application Layer Protocols of TCP – Adaptation of TCP Window – Improvement in TCP Performance – **Mobile Databases :** Introduction – Issues of Transaction Processing – Transaction Processing Environment – Data Dissemination – Transaction Processing in Mobile Environment - Data Replication.

UNIT - 3
Mobile Ad Hoc Networks (MANETs): – Basic concepts– Characteristics– Applications– Design Issues – Routing – Traditional Routing Protocols – Basic concepts of Routing – Popular MANET Routing Protocols – Vehicular Ad Hoc Networks (VANETs) – MANETs Vs. VANETs – Security Issues – Security Attacks on Ad Hoc Networks – **Wireless Sensor Networks (WSNs) :** Introduction – WSN versus MANET – Applications – Architecture of the Sensor Node – Challenges in the Design of an effective DSN – Characteristics of Sensor Networks – WSN Routing Protocols – Target Coverage - **Operating Systems for Mobile Computing :** Basic Concepts – Special Constraints and Requirements – Commercial Mobile OSs – Comparative Study of Mobile OSs – OS for Sensor Networks.

UNIT - 4
Getting Started with Android –- Activities, Fragments and Intents – Android User Interface – Designing User Interface with views – Displaying Pictures and Menus with Views – Data Persistence.

UNIT - 5
Content Providers – Messaging – Location Based Services – Networking – Developing Android Services – Publishing Android Applications.

TEXT BOOKS :
1. Prasant Kumar Pattnaik, Rajib Mall, **"Fundamentals of Mobile Computing"**, PHI Learning
2. Wei Meng Lee, **"Beginning Android 4 Application Development"**, Wiley India Pvt. Ltd, 2012.

REFERENCE BOOK :
1. Ashok K Talkuder, Hasen Ahmed, Roopa R Yavagal, **"Mobile Computing"**, 2nd Edition, Tata McGraw Hill Publishing Company Limited, 2010.

M. Sc. [Information Technology] – Semester - II
Core Practical Course – III : WEB PROGRAMMING LAB

COURSE CODE : P21IT2P3		**HOURS PER WEEK : 4**	
CREDITS : 2		**TOTAL HOURS : 60**	

COURSE OBJECTIVES :
To obtain hands on experience in writing client and server side programs using JavaScript, JQuery and C#.

Course Outcomes:
After the successful completion of this course, the students will be able to

CO. No.	Course Outcomes	Level	Exercise
CO1	Build Web Pages for Department and Travel Agency using HTML Concepts	K3	1 -2
CO2	Construct Web Pages for menu card and student admission process apply CSS and use forms	K3	3 – 4
CO3	Examine the features of JavaScript and JQuery to validate data and perform events	K4	5 – 6
CO4	Determine the form controls in ASP.NET and apply validations , CSS in registration form	K5	7 – 8
CO5	Interface ASP.NET web application to manipulate data from database and XML to display in Grid Control	K5	9 – 11
CO6	Develop Job portal , application of Bharathidasan University, portal for BHC and a simple web service	K6	12 – 15

Ex. No.	Exercises
	HTML, CSS, JavaScript and JQuery:
1.	Create Web Pages for I. T. Department using features in HTML (use frames, tables, links and navigation).
2.	Create Web Pages for a travel agency using frames, tables and lists. Also use images, audio and video attributes.
3.	Create Web Pages to display the menu card of a hotel using CSS style sheets.
4.	Create Web Pages using forms for College Students Admission Process. (Use list box, Push button, Radio button, Command Button, Rich text box, text box, etc where ever applicable).
5.	Create a Registration Form using Java Script. Apply appropriate data validations.
6.	Write a program using Java Script and JQuery to display the calculator in a web page.
	ASP.NET with C#:
7.	Create an ASP.NET Web form using web control to enter Email Registration form and also apply appropriate validation techniques in Email registration form using validation controls.
8.	Write an ASP.NET application to retrieve form data & display it in the client browser in table format (apply CSS styles for look and feel).
9.	Create a Web application to store the details of the books available for sale in XML format.
10.	Create a Web application using ADO.Net that performs basic data manipulations such as : (i) Insertion (ii) Updation (iii) Deletion (iv)Selection
11.	Create an application using Data grid control to access information's form table in SQL Server.
12.	Develop a Job Portal.
13.	Write an ASP.NET application for registering in an on-line course of Bharathidasan University.
14.	Develop a Portal for Bishop Heber College.
15.	Display a "HELLO" message using Web Services.

M. Sc. [Information Technology] – Semester - II
Core Practical Course – IV : MOBILE APPLICATIONS DEVELOPMENT LAB

COURSE CODE : P21IT2P4		**HOURS PER WEEK : 4**
CREDITS : 4		**TOTAL HOURS : 60**

COURSE OBJECTIVES :
To obtain hands-on experience in Mobile Application Development for Android operated devices.

COURSE OUTCOMES
After the successful completion of this course, the students will be able to

CO. No.	Course Outcomes	Level	Exercise
CO1	Build Android application with suitable user interface and android controls	K3	1 – 3, 14
CO2	Make use of image controls perform coloring screen and animate bitmap images.	K3	4 – 6, 11
CO3	Examine the user interface with dialog box and countdown timer.	K4	7 – 8
CO4	Interpret the android controls to store contact details and make phone call.	K5	9 – 10
CO5	Build Android Application to access media file from memory and store images from native applications	K5	12, 15
CO6	Create Android Application to perform data manipulation such as Insert, update, delete and retrieve from SQLite database	K6	13

Ex. No.	Exercise
1	Create simple application to display "Hello World" with text and background colors.
2	Create an application to display toast(message).
3	Create an application to demonstrate list view.
4	Create an application to validate a login module.
5	Create an application to change the color of the screen using menu options.
6	Create an application to change the image displayed on the screen using radio button.
7	Create an application to demonstrate alert dialog box.
8	Create an application to demonstrate countdown timer.
9	Create an application to create a new contact using Intent.
10	Create an application to call specific entered number by user in the edit text.
11	Create an application to animate a bitmap.
12	Create an application to play a media file from the sd card.
13	Create an application to make database operations.
14	Create an application using images and spinner objects.
15	Create an application to take picture using native application.

M. Sc. [Information Technology] – Semester - II
Elective Course – IIA : UNIFIED MODELING LANGUAGE

COURSE CODE : P21IT2:2   **HOURS PER WEEK : 4**
CREDITS : 4   **TOTAL HOURS : 60**

COURSE OBJECTIVES :
To acquire basic understanding on the modeling mechanisms, facilities, tools and techniques available for the design and development of software applications.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall the concepts of requirement model using UML	K1	I
CO2	Outline the basic structural modeling.	K2	I
CO3	Identify advanced structural modeling in terms of high level and low-level model	K3	II
CO4	Identify basics for modeling the behavior if the system.	K4	III
CO5	Determine the insight knowledge into analyzing and designing software using advanced behavioral modeling.	K5	IV
CO6	Create components for deploying the logical concepts of software.	K6	V

UNIT - 1
Principles of Modeling – Object Oriented Modeling – Introduction to UML. **Basic Structural Modeling:** Classes – Relationships – Common mechanisms – Diagrams – Class diagrams.

UNIT - 2
Advanced Structural Modeling:
Advanced Classes – Advanced Relationships – Interfaces, Types and Roles – Packages - Instances – Object diagrams.

UNIT - 3
Basic Behavioural Modeling:
Interactions – Use Cases – Use Case Diagrams – Interaction Diagrams – Activity Diagrams.

UNIT - 4
Advanced Behavioural Modeling:
Events and Signals – State Machines – Processes and Threads – Time and Space – State chart Diagrams.

UNIT - 5
Architectural Modeling:
Components – Deployment – Collaborations – Patterns and Frameworks – Component Diagrams – Deployment Diagrams – Systems and Models.

TEXT BOOK :
1. Grady Booch, James Rumbaugh and Ivar Jacobson, **"The Unified Modeling Language User Guide"**, Addison Wesley – Fourth Indian Reprint 2000.

REFERENCE BOOKS:
1. Rum Baugh, Blaha **"Object - Oriented Modeling and Design with UML"**, 2007
2. Karolyn Nyisztor, Monika Nyisztor **"UML and Object-Oriented Design Foundations: Understanding Object-Oriented Programming and the Unified Modeling Language (Professional Skills)** 2018**.

M. Sc. [Information Technology] – Semester - II
Elective Course - IIB: OBJECT ORIENT ANALYSIS AND DESIGN

COURSE CODE : P21IT2:A **HOURS PER WEEK : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To acquire knowledge on employing Object Oriented Analysis and Design techniques in software designing.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Describe the importance, aims and principles of modelling.	K2	I
CO2	Explain OOPs concepts, Object Oriented Modelling languages and their advantages.	K3	II
CO3	Examine the case studies and model it in different views with respect user requirement such as use case, logical, component and deployment and etc,.	K4	III
CO4	Explain unified library Applications, case study and modeling diagrams using UML.	K5	III
CO5	Explain UML architecture, conceptual model of Unified Modelling Language.	K5	IV
CO6	Analyze various phases of Software development life cycle and preparation of document of the project for the unified Library application	K6	V

UNIT - 1
Uml Diagrams
Introduction to OOAD - Unified Process - UML diagrams - Use Case-Class Diagrmas - Interaction Diagrams - State Diagrams - Activity Diagrams - Package, Component and Deployment Diagrams.

UNIT - 2
Design And Patterns
GRASP-Designing objects with responsibilities-Creator-Information expert-Low Coupling-High Cohesion-Controller-Design Patterns-Creational-Factory method-Structural-Bridge-Adapter-Behavioural –Strategy-Observer.

UNIT - 3
Case Study
Case study-The next Gen POS system, Inception-Use case modelling-Relating Use cases-include, extend and generalization-Elaboration-Domain Models- Finding conceptual classes and description classes-Associations-Attributes-Domain model refinement-Finding conceptual class hierarchies-Aggregation and Composition.

UNIT - 4
Applying Design Patterns
System sequence diagrams-Relationship between sequence diagrams and use cases logical architecture and UML package diagram-Logical architecture refinement-UML class diagrams-UML interaction diagram-Applying GoF design patterns.

UNIT - 5
Coding and Testing
Mapping design to code-Testing: Issues in OO Testing-Class Testing-OO Integration Testing-GUI Testing-OO System Testing

TEXT BOOK :
1. Craig Larman,"Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005.

REFERENCE BOOKS :
1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design using UML", Fourth Edition ,Mc-Graw Hill Education ,2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object Oriented Software", Addison Wesley, 1995.

M. Sc. [Information Technology] – Semester - I
Elective Course – IIC : PRINCIPLES OF USER EXPERIENCE DESIGN

COURSE CODE : P21IT2:B   **HOURS PER WEEK : 4**
CREDITS : 4   **TOTAL HOURS : 60**

COURSE OBJECTIVES :
To acquire exposure on the application of design learning to real-life situations, where communication and collaboration are vital.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall the concepts of User Experience Design.	K1	I
CO2	Outline the tools and techniques used in Research.	K2	II
CO3	Construct the site map and prototypes.	K3	III
CO4	Organize the content, patterns and Layout of the page.	K3	III
CO5	Determine trees, charts and design forms for user input.	K5	IV
CO6	Develop mobile and desktop applications.	K6	V

UNIT - 1
The Tao of UXD: What Is User Experience Design – About UX Designers – Where UX Designers Live? **The Project Ecosystem:** Identify the Type of Site - Choose Your Hats. **Proposals for Consultants and Freelancers:** Proposals - Creating the Proposal - Statements of Work. **Project Objectives and Approach:** Solidify Project Objectives - Understand the Project Approach.

UNIT - 2
User Research: Choosing Research Techniques. **Site Maps and Task Flows**: What Is a Site Map? - What Is a Task Flow? - Tools of the Trade - Basic Elements of Site Maps and Task Flows - Common Mistakes - Advanced Site Maps - Breaking the Site Map Mold - Task Flows - Taking Task Flows to the Next Level. **Wireframes and Annotations:** What Is a Wireframe? - What Are Annotations? - Who Uses Wireframes? - Start Simply: Design a Basic Wireframe. **Prototyping:** What Is Prototyping? - How Much Prototype Do I Need? - Paper Prototyping - Digital Prototyping - Prototype Examples.

UNIT - 3
Organizing the Content: Information Architecture and Application Structure: The Big Picture - The Patterns. **Getting Around: Navigation, Signposts, and Wayfinding:** Staying Found - The Cost of Navigation - Navigational Models - Design Conventions for Websites - The Patterns. **Organizing the Page: Layout of Page Elements:** The Basics of Page Layout - The Patterns.

UNIT - 4
Doing Things: Actions and Commands: Pushing the Boundaries- The Patterns. **Showing Complex Data: Trees, Charts, and Other Information Graphics:** The Basics of Information Graphics- The Patterns. **Getting Input from Users: Forms and Controls:** The Basics of Form Design-Control Choice-The Patterns.

UNIT - 5
Using Social Media: The Basics of Social Media - The Patterns. **Going Mobile**: The Challenges of Mobile Design -The Patterns **Making It Look Good: Visual Style and Aesthetics:** The Basics of Visual Design - What This Means for Desktop Applications - The Patterns.

TEXT BOOKS :
1. Russ Unger and Carolyn Chandler, "**A Project Guide to UX Design - For user experience designers in the field or in the making**", New Riders is an imprint of Peach pit, a division of Pearson Education, 2009 Edition. (For Units – 1 and 2)
2. Jenifer Tidwell, "**Designing Interfaces**", 2nd Edition, Published by O'Reilly Media. (For Units 3, 4 & 5)

REFERENCE BOOKS :
1. Alan Cooper, Robert Remann and David Cronin **"The Essentials of Interaction Design"** 4th Edition.
2. David J Bland, Alexander **Osterwalder** "Testing Business Ideas: A Field Guide for Rapid Experimentation", **Kindle Edition.**

M. Sc. [Information Technology] – Semester - II
Elective Course – IIIA : CRYPTOGRAPY AND NETWORK SECURITY

COURSE CODE : P21IT2:3   **HOURS PER WEEK : 4**
CREDITS : 4   **TOTAL HOURS : 0**

COURSE OBJECTIVES :
To provide understanding on Internet based Cryptographic Techniques & Security Systems.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Relate the working principle of the Cryptographic using number theory	K1	I
CO2	Classify the Symmetric and Asymmetric algorithms	K2	II
CO3	Apply the User Authentication and Kerberos techniques.	K3	III
CO4	Analyze the security concepts through secure socket layer	K4	IV
CO5	Agree to improve the Electronic mail security	K5	V
CO6	Develop the IP security mechanism	K6	V

UNIT - 1
Computer and Network Security Concepts: Computer Security Concepts- The OSI Security Architecture- Security Attacks-Security Services - Security Mechanisms - Fundamental Security Design principles – A model for Network Security - **Introduction to Number Theory:** Divisibility and The Division Algorithm - The Euclidean Algorithm - Modular Arithmetic – Prime Number –Fermat's and Euler's theorems –Testing for primality – The Chinese Remainder theorem

UNIT – 2
Symmetric cipher : Classical Encryption Techniques: Cipher Model - Substitution Techniques - Transposition Techniques - Rotor Machines – Steganography – DES – AES - **Block Cipher Operation:** Multiple Encryption and Triple DES - Electronic Code Book - Cipher Block Chaining Mode - Cipher Feedback Mode - Output Feedback Mode - Counter Mode –RC4.- **Asymmetric cipher :Public Key Cryptography and RSA:** Principles of Public-Key Cryptosystems – RSA Algorithm - Diffie-Hellman Key Exchange - Elgamal Cryptographic System - Elliptic Curve Arithmetic - Elliptic Curve Cryptography.

UNIT – 3
Cryptography Data Integrity Algorithms: Applications of Cryptographic Hash Functions-Two Simple Hash Functions-Requirements and Security-Hash Functions Based on Cipher Block Chaining-Secure Hash Algorithm (SHA) – SHA3 – Message Authentication Code (MAC) – HMAC – **Digital Signature:** RSA –PSS Digital Signature Algorithm – **Key Management and Distribution:** Distribution of Public keys – X.509 Certificates – Public – key Infrastructure- **User Authentication:** Kerberos.

UNIT – 4
Transport Level Security: Web Security Considerations - Secure Sockets Layer - Secure Sockets Layer – HTTPS - Secure Shell (SSH) - **Wireless Network Security:** Wireless Security - Wireless Security - IEEE 802.11 Wireless LAN Overview - IEEE 802.11i Wireless LAN Security

UNIT – 5
Electronic Mail Security: Internet Mail Architecture–Email formats-Email threats–S/MIME-Pretty Good Privacy-**IP Security:** IP security overview–IP Security Policy–Encapsulating Security payload – Internet key exchange

TEXT BOOKS :
1. William Stallings, **"Cryptography and Network Security: Principles and Practices"**, 7th Edition, Pearson Education, 2005.

REFERENCE BOOKS:
1. Atul Kahate, **"Cryptography and Network Security"**, 5th Edition, TMH Publications, New Delhi, 2016.
2. Bruce Schneier, **"Applied Cryptography Protocols, Algorithms"**, Second Edition, „John Wiley & Sons Inc., 2002.
3. Richard E. Smith, **"Internet Cryptography"** ,Addison –Wesley Professional Aug 1997.
4. Behrouz A. Forouzan, **"Cryptography and Network Security"**, Tata McGraw-Hill Publishing Company Limited,2007

M. Sc. [Information Technology] – Semester - II
Elective Course – IIIB : CYBER CRIMES AND COMPUTER FORENSICS

COURSE CODE : P21IT2:C   **HOURS PER WEEK : 4**
CREDITS : 4   **TOTAL HOURS : 60**

COURSE OBJECTIVES :
To acquire knowledge on criminal activities in the cyber world and techniques to investigate and identify illegal activities committed using Computers and Networks.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define the basics of cyber crime	K1	I
CO2	Classify the various cases of cyber crime	K2	I
CO3	Identify the types of security attacks and defensive measures	K3	II
CO4	Analyse the motivation of attackers in cyber security	K4	III
CO5	Select the intrusion detection and prevention system	K5	IV
CO6	Assess the different forensics tools.	K6	V

UNIT - 1
Introduction– Cyber Crime Defined– Computer Crime Technology– Computer Crime on the Internet– Financial Computer Crime– White Collar Computer Crime– Crime Offender or Victim– **Cyber Crime Cases**– Fake Websites–Money Laundering–Bank Fraud–Advance Fee Fraud–Malicious Agents– Stock Robot Manipulation– Identity Theft– Digital Piracy– Intellectual Property Crime– Internet Gambling.

UNIT - 2
Cyber Threats and Defense – Domain Name System Protection – Router Security – Spam/Email Defensive Measures – Phising Defensive Measures – Web Based Attacks – Database Defensive Measures – Botnet Attacks and Applicable Defensive Techniques.

UNIT - 3
Cyber Security Overview – Introduction – Security from a Global Perspective – Trends in the Types of Attacks and Malware – The Types of Malware – Vulnerability Naming Schemes and Security Configuration Settings – Obfuscation and Mutations in Malware – The Attackers Motivation and Tactics – Zero Day Vulnerabilities – Attacks on the Power Grid and Utility Networks – Network and Information Infrastructure Defensive Overview.

UNIT - 4
Intrusion Detection / Prevention System – Overview – The Approaches used for IDS / IPS – Network Based IDS / IPS – Host Based IDS / IPS – Honeypots – The Detection of Polymorphic / Metamorphic Worms – Distributed Intrusion Detection Systems and Standards –SNORT – The Tipping Point IPS – The McAfee Approach to IPS – The Security Community's Collective Approach to IDS / IPS.

UNIT - 5
The Forensic Process – Types of Investigations – The Role of the Investigator – Elements of a Good Process – Defining a Process – After the Investigation – **Documenting the Investigation** – Read Me – Internal Report – Declaration – Affidavit – Expert Report. – **The Justice System** – The Criminal Court System – The Civil Justice System – Expert Status.

Text Book(s):
1. Petter Gottschalk, **"Policing Cyber Crime"**, Petter Gottschalk & Ventus Publishing ApS, 2010.
2. Chwan-Hwa (John) Wu, J. Dravid Irwin, **"Introduction to Computer Networks and Cyber Security"**, CRC Press Taylor & Francis Group, New York, 2013.
3. Aaron Philip, David Cowen, Chris Davis, **"Hacking Exposed Computer Forensics – Secrets & Solutions"** 2nd Edition, TMH Publicaitons, 2010.

Reference Books:
1. Bernadette H Schell, Clemens Martin, **"Cyber Crime"**, ABC – CLIO Inc. California, 2004.
2. Nelson Phillips and Enfinger Steuart, **"Computer Forensics and Investigations"**, Cengage Learning, New Delhi, 2009.

M. Sc. [Information Technology] – Semester - II
Elective Course – III C: CYBER LAWS AND ITS APPLICATIONS

COURSE CODE : P21IT2:D   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To acquire knowledge on the criminal offences, Judicial procedures and punishments in the Computer & Internet based illegal activities.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define the fundamentals of Cyber Law and its Applications	K1	I
CO2	Classify Cyber Crime and Cyber Terrorism	K2	I
CO3	Identify and apply the law of trade mark and domain name	K3	II
CO4	Examine the usage of digit certificate	K4	III
CO5	Asses the steps for investigation and preventive measures	K5	IV
CO6	combine the appropriate cyber crime with the cyber law	K6	V

UNIT - 1
Introduction: Fundamentals of Information technology and cyber Law and its application – Meaning of cyber law – nature and scope of cyber law –**Typology of cyber crime**: Cyber crime- Cyber criminals – computer crime – reason for cyber crime –types of cyber crime- crime against economy- prevention of cyber crime – cyber ethics - **Cyber terrorism:** Definition –tool- reason for cyber terrorism – Danger of cyber terrorism –efforts of combining cyber terrorism

UNIT - 2
Domain Name and trade Mark Law: Domain name – types of Domain name-Disputes, trademark law of Domain name – trademark Vs. Domain name –Cybersquating-Uniform Domain Name Dispute Resolution Policy (UDRP)- An overview of Information Technology Act,2000 –Cyber crime under Information Technology Act, 2000.

UNIT - 3
Digital (Electronic) Signature: Definition – Essential steps of the Digital signature process- Digital signature certificate - Certification Authority – Types of certificate- Authentication of electronic records – Electronic Governance

UNIT - 4
Cyber crime Invesitigation: Precautions at the search site –Steps for the seize –Computer forensics- **Preventive measures of Cybercrime:**Classification of Cybercrimes - Remedial measures to combat cybercrime - Combating Cybercrimes through Legislation – Prevention of Cyber Crime – Preventive Measures

UNIT - 5
Applications of Cyber Law: Online Banking – Network Service Provider – Ecommerce – E-Governance

TEXT BOOK :
1. Shilpa Surayabhan Dongre **,” Cyber Law and Its Applications** “, Current Publication **ISBN:978-81-925610-0-4, 2015**

REFERENCE BOOKS :
1. Dr. S. R. Myneni**, “Information Technology Law (Cyber Laws)” ,** Asia Law House
2. Divya Rohatgi & Shruti Karkare, **“Cyber Law & Crimes”,** Whytes & Co's Guide

M. Sc. [Information Technology] – Semester – III
Core Course – VII : PROGRAMMING WITH PYTHON

COURSE CODE : P21IT307		**HOURS PER WEEK : 5**	
CREDITS : 5		**TOTAL HOURS : 75**	

COURSE OBJECTIVES :
To gain knowledge on programming and problem solving using Python.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Illustrate the basics of Computer programming languages	K2	I
CO2	Determine the Importance of file programs and Exceptions handling	K3	II
CO3	Make use of the built in functions	K3	II
CO4	Develop programs using classes and Objects.	K4	III
CO5	Determine the Importance of database architecture and functions	K5	IV
CO6	Build CGI and GUI applications	K6	V

UNIT - 1
Introduction to Python: Introduction – Python Overview – Control Statements – Iteration – Input from Keyboard- **Strings and Lists**: Strings – Compound Data type –   String Formatting Operator – String Formatting Functions - Lists – Values and accessing elements – Lists are Mutable – Built-in list operators – Built-in List methods - **Tuples and Dictionaries:** Tuples – Creating Tuples –   Basic Tuple Operations – Built-in Tuple Functions - Dictionaries

UNIT - 2
Functions: Introduction– Built-in Functions– User Defined Functions– Python Recursive functions– The anonymous functions– Writing python scripts- **Files and Exceptions**: Text Files– File creation– Reading from a file – Writing to a file – Renaming a file – Deleting a file – File related methods. - Directories –**Exceptions**: Built-in Exceptions – Handling Exceptions - Exception with arguments – User defined Exceptions

UNIT - 3
Files and Exceptions: Text Files – File creation – Reading from a file – Writing to a file – Renaming a file – Deleting a file – File related methods. - Directories –**Exceptions**: Built-in Exceptions – Handling Exceptions - Exception with arguments – User defined Exceptions - **Classes and Objects:** Overview of OOP – Class Definition – Creating Objects – Objects as Arguments – Objects as Return values – Built-in class attributes – Inheritance – Method Overriding – Data Encapsulation – Data Hiding

UNIT - 4
Database Programming: Python DB-API-Object Relational Mappers-Non Relational Database**– Network Programming:** Client Server Architecture–Sockets-Network programming in Python–Socket Server Module

UNIT - 5
GUI Programming : TKinter Programing – Tkinter Examples - **Web Programming:** Building CGI Application – using UNICODE with CGI – Advanced CGI

TEXT BOOK
1. Balagurusamy E, **"Introduction to Computing and Problem Solving Using Python"**, 1st Edition, McGraw Hill Education(India) Private Limited, 2017.
2. Wesley J.Chun, **"Core Python Applications Programming"**, 3rd Edition, Prentice Hall, 2012.

REFERENCE BOOKS
1. Reema Thareja, **"Python Programming using Problem Solving Approach"**, Oxford University Press, 2017.
2. Ashok Namdev Kamthane and Amit Ashok Kamthane, **"Programming and Problem Solving with Python"**, McGrawHill Education, November 2017.
3. Mark Lutz, **"Learning Python"**, O'Reilly, Shroff Publishers & Distributors Private Ltd., June 2017.

M. Sc. [Information Technology] – Semester - III
Core Course – VIII : INTERNET OF THINGS

COURSE CODE : P21IT308		**HOURS PER WEEK : 5**
CREDITS : 5		**TOTAL HOURS : 75**

COURSE OBJECTIVES :
To understand the underlying concepts in Internet of Things (IoT) and to acquire knowledge on state of the art in the IoT, its challenges and future directions.

COURSE OUTCOMES :
After the successful completion of this course, the student will be able to

CO. No.	CO Statement	Level	Unit
CO1	Demonstrate the designs and levels of IoT	K2	I
CO2	Identify Domain Specific IoTs	K3	II
CO3	Utilize both IoT and M2M	K3	II
CO4	Discover IoT design methodology, Devices and Endpoints	K4	III
CO5	Interpret IoT design using case studies	K5	IV
CO6	Elaborate Data analytics for IoT and Tools for IoT	K6	V

UNIT - 1
Introduction to Internet of Things: Introduction – Physical Design of IoT – Logical Design of IoT – IoT Enabling Technologies – IoT Levels & Deployment Templates.

UNIT - 2
Domain Specific IoTs: –Introduction – Home automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health & Lifestyle – **IoT and M2M:** Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT – Software Defined Networking – Network Function Virtualization.

UNIT - 3
IoT Platforms Design Methodology: Introduction – IoT Design Methodology – **IoT Physical Devices and Endpoints**: – What is an IoT device – Exemplary Device: Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Other IoT devices.

UNIT - 4
Case Studies Illustrating IoT Design: Introduction – Home Automation – Smart Lighting – Home Intrusion Detection – Cities – Smart Parking – Environment –Weather Monitoring System – Weather Reporting Bot – Air Pollution Monitoring – Forest Fire Detection – Agriculture – Smart Irrigation – Productivity Applications.

UNIT - 5
Data Analytics for IoT: Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch Data Analysis – Apache Oozie – Apache Spark – Apache Storm – Using Apache Storm for Real-time data analysis. **Tools for IoT:** Introduction – Chef – Chef case studies – Puppet – Puppet case study.

Text Book(s):
1. Arshdeep Bahga, Vijay Madisetti, **"Internet of Things – A Hands-on Approach"**, Universities Press(India) Private Limited, 2016.

Reference Books:
1. Peter Waher**, "Learning Internet of Things"**, PACKT Publishing, 2015.
2. Cuno Pfister, **"Getting Started with the Internet of Things"**, O'Rielly Publication.
3. Francis DaCosta, **"Rethinking the Internet of Things-A Scalable Approach to Connecting Everything",** Apress open publication, 2013 Edition.

M. Sc. [Information Technology] – Semester - III
Core Course – IX : CLOUD COMPUTING

COURSE CODE : P22IT309		**HOURS PER WEEK : 4**	
CREDITS : 4		**TOTAL HOURS : 60**	

COURSE OBJECTIVES:
To understand the Fundamental concepts of Cloud Computing and to acquire knowledge on the Cloud Computing Architectures, infrastructure models and services.

COURSE OUTCOMES
After the successful completion of this course, the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Summarize the fundamentals and essentials. of Cloud Computing	K2	I
CO2	Review various cloud computing concepts and technologies	K3	I
CO3	Explain the services and fundamentals of Hadoop	K3	II
CO4	Design and development of Cloud applications	K4	III
CO5	Determine data center and business Applications	K5	IV
CO6	Understanding various concepts on Cloud security	K6	V

UNIT - 1
Introduction and Concepts:–Introduction–Characteristics–Cloud Models–Cloud Services Examples–Cloud - based Services and Applications– **Cloud Concepts and Technologies:**- Virtualization– Load Balancing–Scalability and Elasticity– Deployment– Replication– Monitoring– Software Defined Networking Network Function Virtualization–Map Reduce–Identity and Access Management–Service Level Agreements-Billing.

UNIT - 2
Cloud Services and Platforms :- Compute Services – Storage Services – Database Services – Application Services – Content Delivery Services – Analytics Services – Deployment and Management Services – Identity and Access Management Services – Open Source Private Cloud Software – **Hadoop and MapReduce** : - Apache Hadoop – Hadoop MapReduce Job Execution – Hadoop Schedulers – Hadoop Cluster Setup.

UNIT - 3
Cloud Application Design : Introduction– Design Consideration for Cloud Applications – Reference Architecture for Cloud Applications – Cloud Application Design Methodologies – Data Storage Approaches – **Python for Cloud** – Python for Amazon Web Services – Python for Google Cloud Platform – Python for Windows Azure – Python for MapReduce – Python Packages of Interest – Python Web Application Framework (Django). – **Cloud Application Development in Python:** - Design Approaches – Image Processing App – Document Storage App – MapReduce App – Social Media Analytics App.

UNIT - 4
Big Data Analytics: - Introduction – Clustering Big Data – Classification of Big Data – Recommendation Systems – **Multimedia Cloud:** - Introduction – Case Study: Live Video Streaming App – Streaming Protocols – Case Study: Video Transcoding App – **Cloud Application Benchmarking and Tuning:** - Introduction – Workload Characteristics – Application Performance Metrics – Design Considerations for a Benchmarking Methodology – Benchmarking Tools – Deployment Prototyping – Load Testing and Bottleneck Detection Case Study – Hadoop Benchmarking Case Study.

UNIT - 5
Cloud Security:–Introduction–CSA Cloud Security Architecture–Authentication–Authorization–Identity and Access Management– Data Security– Key Management– Auditing– **Cloud for Industry, Healthcare & Education:**- Cloud Computing for Healthcare–Cloud Computing for Energy Systems–Cloud Computing for Transportation Systems–Cloud Computing for Manufacturing Industry–Cloud Computing for Education.

TEXT BOOK
1. Arshdeep Bahga, Vijay Madisetti, **"Cloud Computing – A Hands-on Approach"**, Universities Press (India) Pvt. Ltd., Hyderabad, 2014.

REFERENCE BOOKS
1. Rajkumar Buyya, James Broberg, Andrzej Goscinsky, **"Cloud Computing Principles and Paradigms"**, Wiley India Pvt. Ltd., 2011.
2. Barrie Sosinsky, **"Cloud Computing Bible"**, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

M. Sc. [Information Technology] – Semester - III
Core Practical Course – V : PYTHON PROGRAMMING LAB

COURSE CODE : P21IT3P5   **HOURS PER WEEK   : 6**
CREDITS   : 4   **TOTAL HOURS   : 90**

COURSE OBJECTIVES :
To provide practical exposure on programming and problem solving skills with Python.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Exercises
CO1	Apply the basic concepts of programming using Python	K3	1-4
CO2	Construct the program using built in functions of List and string	K3	5,6
CO3	Test for mapping using Dictionary	K4	7, 8
CO4	Asses the execution speed of the program using recursion	K5	9, 10
CO5	Demonstrate Database and Networking Connectivity	K5	11, 12
CO6	Develop GUI and Web Programming	K6	13, 14

1. Program to demonstrate basic operations.

2.   Program using control statement.

3. Program using user defined functions.

4. Program to demonstrate string manipulation.

5. Program using lists.

6. Program using tuples.

7. Program using Dictionaries

8. Program using File Manipulations

9. Program to demonstrate exception handling.

10. Programs using classes and objects

11. Program using databases

12. Program to implement Socket programming

13. Program to demonstrate GUI programming

14. Program to demonstrate web programming.

M. Sc. [Information Technology] – Semester - III
Core Practical Course – VI : INTERNET OF THINGS LAB

COURSE CODE : P21IT3P6   **HOURS PER WEEK   : 5**
CREDITS   : 3   **TOTAL HOURS   : 75**

COURSE OBJECTIVES :

To gain experience in working with IoT Applications developed using Python with Raspberry Pi Micro-controller.

COURSE OUTCOMES:

After the successful completion of this course, the students will be able to

CO. No.	Course Outcomes	Level	Exercise
CO1	Build Raspberry Pi and program to access ports	K3	1
CO2	Identify RGB LED, 7 segment display and temperature measurement using sensors	K3	2 – 3
CO3	Examine different motors and IR sensors	K4	4 – 5
CO4	Determine Wi-Fi and GSM controller and design online Voltmeter	K5	6 – 7
CO5	Interface LoRA and using RTC design IoT Clock	K5	8 – 9
CO6	Design online Radio and Cloud Application	K6	10 – 11

1. Basic Programming with Digital and Analog Ports.
   a) Programming the Digital Ports using Raspberry pi with LED
   b) Reading Analog Data from potentiometer using Raspberry Pi3 with Python
2. Interfacing RGB LED using Raspberry Pi3 with Python
3. Temperature Measurement with LCD Interface.
4. Interfacing DC Motor, Stepper Motor and Servo Motors.
   a) DC Motor Interfacing with Raspberry Pi3 using Python
   b) Stepper Motor Interfacing with Raspberry Pi3
   c) 4C Interfacing Servo motor with Raspberry Pi3
5. IR Remote and IR Receiver Interfacing.
6. Interfacing Wi-Fi and GSM with Controllers
7. Designing Online Voltmeter.
8. Interfacing LoRa Module with Raspberry Pi3.
9. Designing IoT Clock.
10. Designing Online Radio.
11. Cloud Application employing Device Management and Security.

M. Sc. [Information Technology] – Semester - III
Elective Course – IVA : SOFTWARE ENGINEERING

COURSE CODE : P21IT3:4   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :

To understand the principles and practices used in Software Development.

COURSE OUTCOMES:
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Tells the members and Needs of Software Engineering.	K1	I
CO2	Recall the process modeling and Life cycle of Software Engineering.	K1	I
CO3	Identify how to plan and manage the project.	K3	II
CO4	Examine the requirement specification notations.	K4	III
CO5	Interpret the architectural styles, standards and procedures.	K5	IV
CO6	Adapt different testing strategies and quality factors of process models.	K6	V

UNIT - 1
Need for Software Engineering: Need for Software Engineering – About software and S/w engineering – A systems approach, - Engineering approach – Members of the development team – Change in S/w engineering. - Modeling the process and Life cycle: The meaning of process – S/w process models – Tools and techniques for processional modeling – Practical process modeling.

UNIT - 2
Planning and Managing the project: Tracking progress – Project personnel – Effort estimation – Risk management – The project plan – Process models and project management.

UNIT - 3
Capturing the requirements : The requirement process – Types of Requirements – Characteristics of requirements – Expressing requirements – Additional requirements notations – Prototyping requirements – Requirements Documentation – Participants in the requirements process – Requirements validation – Measuring requirements – Choosing a requirements specification Techniques.

UNIT - 4
Designing the system : Design Introduction – Decomposition and Modularity – Architectural styles and strategies – Characteristics of good design – Techniques for improving design – Design evaluation and validation – Documenting the design – Programming standards and procedures – Programming guidelines – Documentation.

UNIT - 5
Testing Strategies : Testing strategic issues–Test strategies for conventional Software–Test strategies for object oriented Software – Validation testing – System testing – Software Testing Fundamentals – Black-box and White-box testing – White box testing – Black box testing – Mccall's Quality factors – ISO 9126 - QF – Software Reengineering: – Software Maintenance – A Software Reengineering process model.

TEXT BOOKS:
1. Shari Lawrence P. Fleeger, "**Software Engineering Theory and Practice",** 2nd Edition, Pearson Education, Delhi, 2001. [(for Units 1–4) Chapters 1, 2, 3, 4, 5, 7]
2. Roger S. Pressman, "**Software Engineering a Practitioner's Approach"**, 6th Edition, Tata McGraw Hill Publication, [(for Unit 5) Chapters: 13, 14, 15, 31]

REFERENCE BOOKS:
1. Ian Somerville, **"Software Engineering",** 6th Edition, Pearson Education, Delhi, 2005.
2. Douglas Bell, **"Software Engineering for Students-A Programming Approach"**, 4th Edition, Pearson Education, Delhi 2007

[M. Sc. [Information Technology] – Semester - III
Elective Course – IV B : SOFTWARE TESTING

COURSE CODE : P21IT3: A   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To acquire knowledge on the principles and practices used in Software Testing

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall the Software Development Life cycle.	K1	I
CO2	Illustrate the need for testing in software development process.	K2	II
CO3	Identify the needs of system testing.	K3	III
CO4	Analyse test phases and formulate tools for testing.	K4	IV
CO5	Build test plan, manage and report the software developed.	K6	V
CO6	Create test automation tools for programming model.	K6	V

UNIT - 1

Software Development Life Cycle Models:–Phases of Software Project–Quality, Quality Assurance and Quality control – Testing, Verification & Validation – Process Model – Life Cycle Models - **White Box Testing:** Overview of White Box Testing – Static Testing – Structural Testing – Challenges - **Black Box Testing:** Overview of Black Box Testing – Need for Black Box Testing – When to do Black Box Testing? – How to do Black Box Testing?

UNIT - 2

Integration Testing: Overview of Integration Testing – Integration Testing as a Type of Testing – Integration Testing as a Phase of Testing – Scenario testing – Defect Bash - **System and Acceptance Testing:** Overview – Need for System Testing – Functional Vs Non Functional Testing – Functional System Testing – Non Functional Testing – Acceptance Testing – Summary of Testing Phases.

UNIT - 3

Performance Testing: Factors governing Performance Testing – Methodology for Performance Testing – Tools for Performance Testing – Process for Performance Testing - **Regression Testing:** – What is Regression Testing – Types of Regression Testing – When to do Regression Testing – How to do Regression Testing – Best Practices in Regression Testing.

UNIT - 4

Internationalization ($I_{18}n$) Testing: - Primer – Test Phases – Enabling Testing – Locale Testing – Validation – Language Testing – Localization Testing – Tools – Challenges and Issues – **Ad hoc Testing:** - Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative Testing – Agile and Extreme Testing – Defect Seeding – **Usability and Accessibility Testing:** - Overview of Usability Testing – Approach – When to do Usability Testing? – How to Achieve Usability? – Quality Factors – Aesthetics Testing – Accessibility Testing – Tools – Lab Setup – Test Roles

UNIT - 5

Test Planning, Management, Execution and Reporting:-Test Planning-Test Management–Test Process–Test Reporting–Best Practices-**Software Test Automation:** What is Test Automation–Terms used in Automation–Skills Needed for Automation–What to Automate, Scope of Automation–Design & Architecture for Automation–Generic Requirement for Test Tool Framework– Process model for Automation– Selecting a Test tool– Automation for Extreme Programming Model– Challenges in Automation.

TEXT BOOKS:

1. Srinivasan Desikan, Gopalaswamy Ramesh, "**Software Testing–Principle & Practices"**, Pearson Education, New Delhi, 2006.

REFERENCE BOOKS

1. Ron Patton, "Software Testing", 2nd Edition, Pearson Education, New Delhi, 2006.
2. William E. Perry, "Effective Methods for Software Testing", 3rd Ed., Wiley India, 2006.
3. Renu Rajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", TMH Publishing Company Limited, New Delhi, 2004.

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M. Sc. [Information Technology] – Semester - III
Elective Course – IVC: SOFTWARE PROJECT MANAGEMENT

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COURSE CODE : P21IT3: B   **HOURS PER WEEK : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :

To know the basics of Software Project Management, responsibilities of Software Project Manager and Risk Management.

COURSE OUTCOMES:

After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Recall steps involved in project planning.	K1	I
CO2	Outline the cost and risk in project.	K2	II
CO3	Plan the project schedule, manage risk and identify hazards in project.	K3	III
CO4	Analyze how to prioritize and manage and controls the contract.	K4	IV
CO5	Determine the team involved in project.	K5	V
CO6	Build the safety and health of the people involved in project.	K6	V

UNIT - 1
Introduction to Software Project Management Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT - 2
Project Evaluation: Strategic Assessment – Technical Assessment – Cost Benefit Analysis–Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT - 3
Activity Planning Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT - 4
Monitoring and Control: Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Priortizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT - 5
Managing People And Organizing Teams : Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

TEXT BOOKS:
1. Bob Hughes, Mike Cotterell, **"Software Project Management"**, 4th edition. TMH, 2009

REFERENCE BOOKS:
1. Walker Royce, **"Software Project Management"**, Pearson Education, 1998.
2. Pankaj Jalote, **"Software Project Management in Practice"**, Pearson Education, 2002.

M. Sc. [Information Technology] – Semester - III
Generic Course: SUSTAINABLE DEVELOPMENT GOALS

COURSE CODE : P22IT3G1   **HOURS PER WEEK : 1**
CREDITS   : 1   **TOTAL HOURS   : 15**

COURSE OBJECTIVES:
To obtain knowledge to provide the knowledge, skills, attitudes and values necessary to address sustainable development challenges in favor of environmental integrity and economic viability.

COURSE OUTCOME:
On completion of the Course the students will be able to

Sl. No	Course outcome	Level	Unit
1.	Define sustainable development goals and its relevance	K1	I
2.	Identify the various sustainable development goals	K2	I
3.	Describe the relevance of SDGs in today's goals	K3	III
4.	Classify the social issues in the light of the SDGs	K3	IV
5.	Ascertain the indicators of SDG	K3	V
6.	Determine the progress of India in the light of its achievements in SDG's	K4	V

Unit I: Introduction to Sustainable Development Goals
History, Post 2015 Development Agenda and Millennium Development Goals (MDG).

Unit II: SDG's 1 to 6
(1) No Poverty, (2) Zero Hunger, (3) Good Health and Well-being, (4) Quality Education, (5) Gender Equality, (6) Clean Water and Sanitation.

Unit III: SDG's 7 to 12
(7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation and Infrastructure, (10) Reduced Inequality, (11) Sustainable Cities and Communities, (12) Responsible Consumption and Production.

Unit IV: SDG's 13 to 17
(13) Climate Action, (14) Life Below Water, (15) Life on Land, (16) Peace, Justice and Strong Institutions, (17) Partnership for the Goals.

Unit V: SDGs in India and Tamil Nādu
Establishment of Niti-Aayog – Measuring India and its progress in SDGs – SDG India Index – Baseline Report 2018.

REFERENCES:
Ajay Ahalwat (2019) Sustainable Development Goals: Directive Principles for Sustainable India by 2030 (Paperback)
https://sdgs.un.org/goals

M. Sc. [Information Technology] – Semester - IV
Core Course – X : BIGDATA ANALYTICS

COURSE CODE : P21IT410   **HOURS PER WEEK : 5**
CREDITS : 5   **TOTAL HOURS : 75**

COURSE OBJECTIVES :
To obtain knowledge in Data Mining concepts and techniques and to understand the Big Data basics and the Analytics for Enterprise class Hadoop

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Interpret the importance of data mining.	K2	I
CO2	Organize and prepare the data needed for data mining using preprocessing techniques.	K3	II
CO3	Examine the basic principles, concepts and applications of data warehousing and data mining.	K4	III
CO4	Analyze the Conceptual, Logical, and Physical design, Data Warehouses, OLAP applications and OLAP deployment.	K4	III
CO5	Criticize Infosphere Big Insights and Big Data Recommendations.	K5	IV
CO6	Build on Big data application Using Pig and Hive.	K6	V

UNIT – 1
Introduction to Big Data: Characteristics and Types of Digital Data: Unstructured, Semi- structured and Structured - Introduction to Big Data - Sources of Big Data - Characteristics and Necessity of Big

Data – Big Data Terminologies – Big Data Architecture - Challenges of Big Data – Data Environment Vs Big Data Environment – Data in Data warehouse Vs Hadoop Environment - Key Roles for the New Big Data Ecosystem - Big Data Applications.

UNIT - 2

Introduction to Big Data Analytics: Big Data Analytics - Business Intelligence Vs Data Science, Different types of Analytics: Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics – Classification of Analytics – Data Analytics Life Cycle – IBM Big Data Strategy - Data Scientist: Skills and Responsibilities.

UNIT - 3

Big Data Management: Introduction to NoSQL Database– Features – Types of NoSQL Database – Merits and Demerits of NoSQL – Applications – Introduction to NewSQL , MangoDB and Apache Cassandra– Needs and Characteristics - SQL Vs NoSQL Vs NewSQL. - **Big Data Use Cases:** Patterns for Big Data Deployment: IT for IT Log Analytics, Fraud Detection Pattern, the Social Media Pattern, Big Data and Energy Sector, Risk Patterns for Modelling and Management.

UNIT - 4

Introduction to Hadoop: Features – Advantages–Versions – Hadoop Ecosystem – Hadoop Architecture - Hadoop Distributions – Hadoop Vs SQL – DBMS Vs Hadoop. **Big Data: From the Technology Perspective:** Application Development in Hadoop: Pig and PigLatin – Hive – Jaql – Getting Data into Hadoop: Basic Copy Data – Flume – Other Hadoop Components: Zookeeper – Hbase – Oozie –Lucene – Avro.

UNIT – 5

Hadoop Distributed File System: Design – Concepts – Command Line Interface- Hadoop File System: Interfaces: HTTP, C and FUSE. MapReduce – Types- Input and Output Formats – Features. Introduction to YARN: Components – Applications. Data Serialization in Hadoop.

TEXT BOOKS:
1   Seema Acharya, Subhashini Chellappan, "**Big Data and Analytics**", Wiley Publication, 2016.
2   Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch,George Lapis **"Understanding Big Data: Anaytics for Enterprise Class Hadoop and Streaming Data",** McGraw-Hill, 2012. (for Units 4 & 5).

REFERENCE BOOKS:

1   Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "**Big Data for Dummies**", John Wiley & Sons, Inc., 2013.
2   Tom White, "**Hadoop: The Definitive Guide**", O'Reilly Publications, 2011.

M. Sc. [Information Technology] – Semester - IV
Elective Course - VA: MACHINE LEARNING

COURSE CODE : P21IT4:5   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
Understand the basics of machine learning, Bayseian and Computational learning, Instant learning and Advanced learning and to acquire knowledge on Neural Networks and Genetic Algorithms.

COURSE OUTCOMES
After the successful completion of this course, the student will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define the characteristics of datasets and relate the trivial data and big data for various applications.	K1	I
CO2	Compare the Parametric and Multivariate methods	K2	II
CO3	Identify the concept behind Dimensionality reduction and clustering	K3	III
CO4	Categorize Decision trees and Rule based models	K4	IV
CO5	Build the advanced learning rules	K5	V

| CO6 | Improve the usage of advanced learning techniques | K6 | V |

UNIT - 1
Introduction: What Is Machine Learning?- Examples of Machine Learning Applications- **Supervised Learning:** Vapnik-Chervonenkis (VC) Dimension- Probably Approximately Correct (PAC) Learning- Noise- Regression- Dimensions of a Supervised Machine Learning Algorithm- **Bayesian Decision Theory**: Classification- Utility Theory- Association Rules

UNIT - 2
Parametric Methods: Maximum Likelihood Estimation- The Bayes' Estimator- Parametric Classification- Regression- Model Selection Procedures. **Multivariate Methods**: Multivariate Data- Parameter Estimation- Estimation of Missing Values- Multivariate Classification- Tuning Complexity

UNIT - 3
Dimensionality Reduction: Subset Selection- Principal Components Analysis- Factor Analysis- Multidimensional Scaling- Linear Discriminant Analysis- Isomap. **Clustering:** Mixture Densities- k- Means Clustering- Expectation-Maximization Algorithm- Mixtures of Latent Variable Models- Supervised Learning after Clustering- Hierarchical Clustering- Choosing the Number of Clusters.

UNIT - 4
Decision Trees: Univariate Trees- Pruning- Rule Extraction from Trees- Learning Rules from Data- Multivariate Trees. **Local Models:** Radial Basis Functions- Incorporating Rule-Based Knowledge- Normalized Basis Functions. **Bayesian Estimation:** Estimating the Parameter of a Distribution- Bayesian Estimation of the Parameters of a Function

UNIT - 5
Advanced Learning: Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules– Sets of First Order Rule–Induction on Inverted Deduction–Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – **Reinforcement Learning**: Task–Q-Learning – Temporal Difference Learning.

TEXT BOOK
1. Ethem Alpaydin, "**Introduction to Machine Learning**", Second Edition, The MIT Press, Cambridge, 2010.
2. Tom M. Mitchell, "**Machine Learning**", First Edition, McGraw Hill Education Private Ltd., 1997.

REFERENCE BOOKS
1. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "**Foundations of Machine Learning**", second edition, The MIT Press, 2018.

M. Sc. [Information Technology] – Semester - IV
Elective Course – VB : SOFT COMPUTING

COURSE CODE : P21IT4:A   **HOURS PER WEEK   : 4**
CREDITS   : 4   **TOTAL HOURS   : 60**

COURSE OBJECTIVES :
To understand the concepts and technologies of Soft Computing.

COURSE OUTCOMES
After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define fuzzy Set Theory	K2	I
CO2	Recall Mamdani Fuzzy, Sugeno Fuzzy and Tsukamoto Fuzzy Models	K2	I
CO3	Apply the Neural Networks with Supervised Learning, Unsupervised Learning and Competitive Learning Networks	K3	II
CO4	Inspect the Neuron Functions for Adaptive Networks	K4	III
CO5	Establish the Soft Computing for Color Recipe Prediction	K5	IV

CO6	Appraise the Application of Computational Intelligence in Soft Computing	K6	V

UNIT- I
Fuzzy Set Theory : Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems– Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT- II
Optimization : Derivative based - Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT -III
Neural Networks : Supervised Learning Neural Networks – Perceptrons – AdalineBackpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT - IV
Neuro Fuzzy Modeling : Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT - V
Application of Computational Intelligence : Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TEXT BOOK:
1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro Fuzzy and Soft Computing", PHI, 2004.

REFERENCE BOOKS :
1. Timothy J. Ross, "Fuzzy Logic with Engineering Application, "McGraw Hill, 1977
2. Davis E. Goldberg, "Genetic Algorithms Search, Optimization & Machine Learning", Addision Wesley, 1989.
3. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms",PHI, 2003. EmereoPtv Limited, July 2008.
4. Ahmar, Abbas, "Grid Computing - A Practical Guide to technology and Applications", Charles River Media, 2003.

M. Sc. [Information Technology] – Semester - IV
Elective Course – VC : HUMAN COMPUTER INTERACTION

COURSE CODE : P21IT4:B   **HOURS PER WEEK : 4**
CREDITS : 4   **TOTAL HOURS : 60**

COURSE OBJECTIVES :
To understand the facilities and technologies available for interaction between Human Beings and Computers.

COURSE OUTCOMES
After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Show HCI, User interface software tools, Models, Theories, and Frameworks	K2	I
CO2	Explain Usability Engineering Methods and Concepts	K2	II
CO3	Apply HCI techniques and concepts for software design	K3	II
CO4	Motivate Groupware and Cooperative Activity	K4	III
CO5	Estimate Media and Information	K5	IV
CO6	Elaborate Integrating Computation and Real Environments	K6	V

UNIT - 1

Models, Theories, and Frameworks : A Effective Use and Reuse of HCI Knowledge – Macrotheory for System of Interactors – Design in the MoRAS – Distributed Cognition : Toward a New Foundation for Human-Computer Interaction Research. – **User Interface Software and Tools :** - Past, Present, and Future of User Interface Software Tools – Creating Creativity : User Interfaces for Supporting Innovations – Interaction Spaces for Twenty-First-Century Computing.

UNIT - 2

Usability Engineering Methods and Concepts : - The Strategic Use of Complex Computer Systems – User Interface Evaluation : How Cognitive Models can Help – HCI in the Global Knowledge-Based Economy : Designing to Support Worker Adaptation – A Reference Task Agenda for HCI – The Maturation of HCI: Moving beyond Usability toward Holistic Interaction.

UNIT - 3

Groupware and Cooperative Activity : Computer-Mediated Communications for Group Support : Past and Future – The Intellectual Challenge of CSCW : The Gap between Social Requirements and Technical Feasibility – Social Translucence: Designing Systems That Support Social Processes – Transcending the Individual Human Mind : Creating Shared Understanding through collaborative Design – The Development of Cooperation: Five Years of Participatory Design in Virtual School – Distance Matters.

UNIT - 4

Media and Information : : Designing the User Interface for Multimodal Speech and Pen-Based Gesture Applications: State-of-the-Art Systems and Future Research Directions – Technologies of Information : HCI and Digital Library – Interface that Give and Take Advice – Beyond Recommender Systems : Helping People Help Each Other.

UNIT - 5

Integrating Computation and Real Environments : - Charting Past, Present, and Future Research in Ubiquitous Computing – Situated Computing : The Next Frontier for HCI Research – Roomware : Toward the Next Generation of Human – Computer Interaction based on an Integrated Design of Real and Virtual Worlds. – Emerging Framework for Tangible User Interfaces – **HCI and Society** : Learner-Centered Design : Reflections and New Directions – HCI Meets the "Real World" : Designing Technologies for Civic Sector Use – Beyond Blowing Together : Socio Technical Capital.

TEXT BOOK:

1. John M. Carroll, "Human Computer Interaction–in the New Millennium", Pearson Education, 2007.

REFERENCE BOOK:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human-Computer Interaction", Pearson Education, 2009.

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EXTRA CREDIT COURSES

M. Sc. [Information Technology]

(for students admitted from the academic year 2022-2023 onwards)

M. Sc. [Information Technology] – Semester - III
Extra Credit Course – I : PARALLEL COMPUTING

COURSE CODE :   **HOURS PER WEEK   :**
CREDITS   : 2   **TOTAL HOURS   :**

COURSE OBJECTIVES :
To introduce algorithm design and programming for parallel computing architectures.

COURSE OUTCOMES
After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define Parallel Computing and Parallel Computing Platforms	K2	I
CO2	Explain Parallel Algorithm Design	K2	II
CO3	Develop Basic Communication Operations	K3	II
CO4	Examine Analytical and Message Passing Programming Models	K4	III
CO5	Explain Shared Address Space Programs and Dense Matrix Algorithms	K5	IV
CO6	Develop Algorithms for Sorting, Graph handling and Searching	K6	V

UNIT – 1

Introduction to Parallel Computing: Motivating parallelism – Scope of parallel computing – **Parallel Programming platforms:** Implicit parallelism : Trends in Microprocessor Architecture – Limitations of memory system performance – Dichotomy of parallel computing platforms – Physical organization of platforms – Communication costs in parallel machines – Routing mechanisms for interconnection networks – Impact of Process-Process Mapping and Mapping Techniques.

UNIT - 2

Principles of Parallel Algorithm Design: Preliminaries - Decomposition techniques – Parallel algorithm models – **Basic Communication Operations:** One-to-All broadcast and All-to-one reduction – All-to-All broadcast and reduction – All-to-All Personalized communication – Circular shift.

UNIT - 3

Analytical Modeling of Parallel Programs: Performance metrics for parallel systems – The Effect of Granularity on Performance – Scalability of Parallel Systems - **Programming using the Message Passing Paradigm:** Principles – Building blocks – MPI – Topologies and embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations – Groups and Communicators.

UNIT - 4

Programming Shared Address Space Platforms – Thread Basics – The POSIX Thread API – Thread Basics : Creation and Termination – Synchronization Primitives in Pthreads – Controlling Thread and Synchronization Attributes – Thread Cancellation – Composite Synchronization Contructs – OpenMP (Open Multiprocessing) Programming - **Dense Matrix Algorithms:** Matrix-Vector multiplication – Matrix-Matrix multiplication.

UNIT - 5

Sorting: Issues in Sorting on Parallel Computers - Sorting networks – Bubble sort – Quick sort **Graph Algorithms:** Definitions and Representation - Minimum spanning tree – Single-source shortest path – All pairs shortest paths - **Search Algorithms for Discrete Optimization Problems:** Definitions and Examples – Sequential search – Parallel Depth-first search – Parallel Best-first search.

TEXT BOOK :

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, *"Introduction to Parallel Computing"*, Second Edition, Pearson Education., Delhi, 2008

REFERENCE BOOK :

1. Barry Wilkinson, Michael Allen, *"Parallel Programming : Techniques and Applications Using Networked Workstations and Parallel Computers"*, 2nd Edition, Pearson Education., New Delhi, 2005.

M. Sc. [Information Technology] – Semester - IV
Extra Credit Course – II : ARTIFICIAL INTELLIGENCE

COURSE CODE :   **HOURS PER WEEK :**
CREDITS   **: 2**   **TOTAL HOURS :**

COURSE OBJECTIVES :
To understand the concepts and technologies of Artificial Intelligence.

COURSE OUTCOMES
After the successful completion of this course the students will be able to

CO. No.	Course Outcomes	Level	Unit
CO1	Define Artificial Intelligence, Problems, Problem Spaces and Search	K1	I
CO2	Explain Heuristic Search Techniques	K2	I
CO3	Solve Knowledge Representation Issues using Predicate Logic.	K3	II
CO4	Distinguish symbolic reasoning and statistical reasoning techniques	K4	III
CO5	Explain Filler Structures, Knowledge Representation and Game Playing	K5	IV
CO6	Discuss on Planning, Understanding and Natural Language Processing	K6	V

UNIT - 1

Overview of Artificial Intelligence: - The AI Problems – The Underlying Assumption – AI Technique – **Problems, Problem Spaces and Search:** - Defining the problem as a state space search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in design of search programs – **Heuristic Search Techniques**: - Generate-and-Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction.

UNIT - 2

Knowledge Representation Issues: - Representations and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem – **Using Predicate Logic:** - Representing simple facts in Logic – Representing Instances and ISA Relationships – Computable Functions and Predicates – Resolution – Natural Detection – **Representing Knowledge using Rules**: - Procedural Versus Declarative Knowledge – Logic Programming – Forward versus Backward Reasoning – Matching – Control Knowledge.

UNIT - 3

Symbolic Reasoning under Uncertainty:- Introduction to Non-Monotonic Reasoning – Logics for Non-Monotonic Reasoning – Implementation Issues – Augmenting a Problem Solver – Implementing Breadth First and Depth-First Searches – **Statistical Reasoning:** - Probability and Baye's Theorem – Certainty Factors and Rule Based Systems – Bayesian Networks – Dempster-Shafer Theory – Fuzzy Logic.

UNIT - 4

Weak Slot and Filler Structure: – Semantic Nets - Frames - **Strong Slot and Filler Structure: -** Conceptual Dependency – Scripts – CYC – **Knowledge Representation Summary:** - Syntactic-Semantic Spectrum of Representation – Logic and Slot-and-Filler Structures – Other Representational Techniques – Summary of the Role of Knowledge – **Game Playing:** - Overview – The Minimax Search Procedure – Adding Alpha-Beta Cut-offs – Additional Refinements – Iterative Deepening.

UNIT - 5

Planning: -Overview–An Example Domain: The Blocks World–Components of a Planning System–Goal Stack Planning–Non-linear Planning using Constraint Posting–Hierarchical Planning–Reactive Systems–Other Planning Techniques–**Understanding:** -Overview of Understanding–What makes Understanding hard – **Natural Language Processing:** - Introduction – Syntactic Processing – Semantic Analysis.

TEXT BOOK
1. Elain Rich, Kevin Knight, Shivashankar B. Nair, *"Artificial Intelligence"*, 3rd Edition, TMH Publications, 2009.